

# MICROLEAD TECHNOLOGIES

## STUDENT LABORATORY MANUAL

WORLD CLASS TRAINING CENTER

- AutoCAD
- Autodesk VIZ
- Autodesk Inventor
- Autodesk Land Desktop
- Architectural Desktop
- Autodesk Civil 3D
- Autodesk Civil Design
- Autodesk Revit
- 3DS MAX
- STAAD.Pro
- Adobe Photoshop
- Microsoft Project

**Autodesk**  
Authorized Training Center

 Research Engineers Inc.



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(Computer- Aided Design, Drafting and Color Rendering)

## A STUDENT LABORATORY MANUAL IMPORTANT ...!!!

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MANUAL RELEASES: AUTOCAD 12 /1993, AUTOCAD 13 /1994, AUTOCAD R14 / 1997, AUTOCAD 2000 / 1999, AUTOCAD 2001 / 2002, AUTOCAD2004, AUTOCAD2005, AUTOCAD2006



1. Students are not allowed to wear the following inside the MCAD laboratory room:



slippers/sandals



shorts



head gear



sando( for men)

2. Students are not allowed to bring  even water and  smoking inside the laboratory.

3. Students may have their 500ml  filled with  for free except for SM Sta Mesa Branch.

4. For Cubao Branch,  smoking should be done only in the far end of the corridor near the  for the convenience of  the majority. (non-smokers)

5. Students should set their  to silent or vibratory mode once inside the laboratory room. Moreso, students should entertain calls outside the laboratory room irregardless if the student is attending the class or just having hands-on / practicing.

6. Students are not allowed to  move, alter, dismantle and exchange any equipment inside MCAD laboratory. Students are not allowed to modify thermostat setting of the A/C unit or touch any electrical panels.

7. Students are not allowed to install any  software or hardware, run any  or VCD in MCAD laboratory and library using MCAD equipment.

8. Students are not allowed to use any kind of  or any recording devices inside MCAD premises without written authorization  from the top management.

9. Students are not allowed to bring any  companion inside (who is not enrolled in the same course) inside his/her class. If the companion was a student, inform him/her to proceed at the frontdesk area and LOG.

10. Students are not allowed to distribute calling cards,  brochures,  flyers  or any similar whose intention (direct/indirect) is to market his/her services (similar to the services of Microcadd) without written approval of the top management.

11. Students should keep OFF    on walls along the corridors and laboratory

12. Students are not allowed to alter wallpaper of Windows Settings of PC's application softwares and operating systems.

### IMPORTANT!!!

13. In case of  and Malacañang declares suspension of classes in all levels, morning classes (8:00 a.m. / 9:00am schedules) are automatically suspended. 10 - 6, 1 - 6, and 6 - 9 classes, the decision will still be based on the current weather status and shall be decided by the Management of Microcadd Tech. All students MUST call/text the following contact numbers 2 hours prior to the start of class for confirmation purpose: 

09228118254

09228136118

09228136051

911-20-55

911-60-55

913-22-12

# TABLE OF CONTENTS

## LESSON I

|                                        |   |
|----------------------------------------|---|
| Electronic Data Processing (EDP) ..... | 1 |
| Input Devices .....                    | 1 |
| Output Devices .....                   | 2 |
| Printing Devices .....                 | 2 |
| Data Storages .....                    | 2 |
| Softwares .....                        | 3 |

## LESSON II

|                                                            |    |
|------------------------------------------------------------|----|
| Stepping into AutoCAD .....                                | 4  |
| Startup Dialog Box .....                                   | 5  |
| Understanding the AutoCAD Window .....                     | 6  |
| Using Button Functions of a Mouse .....                    | 7  |
| Understanding Toolbars, Function Keys,<br>Status Bar ..... | 8  |
| Using Line, F8, Erase & Oops .....                         | 9  |
| AutoCAD Coordinate System .....                            | 11 |
| Absolute Coordinate .....                                  | 11 |
| Relative Rectang Coordinate .....                          | 11 |
| Relative Polar Coordinate .....                            | 12 |
| Direct Distance Entry .....                                | 12 |
| Polar Tracking and Snap .....                              | 13 |
| Dynamic Input .....                                        | 14 |

## LESSON III

|                       |     |
|-----------------------|-----|
| Draw Commands .....   | 15  |
| Linears .....         |     |
| Line .....            | 16  |
| Trace .....           | 16  |
| Fill .....            | 16  |
| Pline .....           | 16  |
| Sketch .....          | 17  |
| Mline .....           | 102 |
| Ray .....             | 18  |
| Xline .....           | 18  |
| Curves .....          |     |
| Circle .....          | 19  |
| Revcloud .....        | 20  |
| Donut .....           | 20  |
| Spline .....          | 21  |
| Ellipse .....         | 21  |
| Arc .....             | 30  |
| Special Objects ..... |     |
| Rectang .....         | 22  |
| Polygon .....         | 23  |
| Hatch .....           | 24  |
| Object Snaps .....    | 27  |

## LESSON IV

|                                         |    |
|-----------------------------------------|----|
| Drawing & Labelling a Simple Plan ..... | 31 |
| Offset .....                            | 32 |
| Fillet .....                            | 32 |
| Trim .....                              | 32 |
| Drafting of A Studio .....              | 33 |
| Text/Dtext/Mtext .....                  |    |
| Justifying Text .....                   | 34 |
| Text / Dtext .....                      | 35 |
| Mtext .....                             | 35 |
| Special Text Characters .....           | 36 |
| Autostack .....                         | 36 |
| Bullets and Numbering .....             | 37 |
| Editing Text/Dtext /Mtext .....         |    |
| Spell .....                             | 38 |
| Ddedit .....                            | 38 |
| Property Icon .....                     | 39 |
| Quick Select .....                      | 40 |
| Find .....                              | 40 |
| Text Style and Fonts .....              | 41 |
| Table .....                             | 42 |
| Field .....                             | 43 |

## LESSON V

|                                     |    |
|-------------------------------------|----|
| Units .....                         | 44 |
| Computing Onscreen Paper Size ..... | 44 |
| Drafting a Title Block .....        | 45 |
| Display and View Commands .....     | 47 |
| Utilities Commands .....            | 48 |

## LESSON VI

|                                            |    |
|--------------------------------------------|----|
| Modify and Construct Commands .....        |    |
| Command to Duplicate .....                 |    |
| Array .....                                | 50 |
| Copy .....                                 | 52 |
| Offset .....                               | 31 |
| Mirror .....                               | 53 |
| Command to Clean Corners .....             |    |
| Fillet .....                               | 32 |
| Chamfer .....                              | 54 |
| Command to Modify Object Orientation ..... |    |
| Rotate .....                               | 54 |
| Move .....                                 | 55 |
| Align .....                                | 55 |
| Command to Resize Object .....             |    |
| Scale .....                                | 56 |
| Stretch .....                              | 56 |



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**AutoCAD 2007**



|                                                                |     |  |  |
|----------------------------------------------------------------|-----|--|--|
| Command to Edit Polyline                                       |     |  |  |
| Pedit .....                                                    | 57  |  |  |
| Explode .....                                                  | 58  |  |  |
| Use of Grips .....                                             | 58  |  |  |
| Command to change position of endpoints                        |     |  |  |
| Extend .....                                                   | 59  |  |  |
| Lengthen .....                                                 | 59  |  |  |
| Change .....                                                   | 60  |  |  |
| Break .....                                                    | 60  |  |  |
| Join .....                                                     | 60  |  |  |
| Creating 2D Templates .....                                    | 61  |  |  |
| <b>LESSON VII</b>                                              |     |  |  |
| Blocking                                                       |     |  |  |
| Group .....                                                    | 66  |  |  |
| Block .....                                                    | 67  |  |  |
| Insert .....                                                   | 68  |  |  |
| Explode .....                                                  | 68  |  |  |
| Wblock .....                                                   | 69  |  |  |
| Rename .....                                                   | 70  |  |  |
| Purge .....                                                    | 70  |  |  |
| Dynamic Block .....                                            | 71  |  |  |
| AutoCAD Design Center .....                                    | 76  |  |  |
| Tool Palette .....                                             | 78  |  |  |
| Refedit .....                                                  | 79  |  |  |
| Point, Divide and Measure .....                                | 80  |  |  |
| Attributes .....                                               | 89  |  |  |
| Inquiry .....                                                  | 82  |  |  |
| <b>LESSON VIII</b>                                             |     |  |  |
| Layer .....                                                    | 85  |  |  |
| Matchprop .....                                                | 89  |  |  |
| Floor Plan .....                                               | 91  |  |  |
| Multiple Document Environment .....                            | 92  |  |  |
| <b>LESSON X</b>                                                |     |  |  |
| Dimension                                                      |     |  |  |
| AutoCAD Dimension Method .....                                 | 93  |  |  |
| Creating Curve Dimension .....                                 | 94  |  |  |
| Creating Linear Dimension .....                                | 95  |  |  |
| Leader .....                                                   | 96  |  |  |
| Linear, Continue and Baseline Dimension .....                  | 97  |  |  |
| Dimension Commands and Variables .....                         | 98  |  |  |
| Creating Dimension Styles .....                                | 100 |  |  |
| Editing Dimension Properties .....                             | 101 |  |  |
| Creating Multi-lines                                           |     |  |  |
| Mline .....                                                    | 102 |  |  |
| Mlstyle .....                                                  | 103 |  |  |
| Mledit .....                                                   | 104 |  |  |
| <b>LESSON XI</b>                                               |     |  |  |
| 3D Modelling                                                   |     |  |  |
| 3D Surface and 3D Solid .....                                  | 105 |  |  |
| Converting Primitives Into a 3D Model .....                    | 105 |  |  |
| Solid Editing .....                                            | 107 |  |  |
| Commands to Create and Edit 3D Objects .....                   | 107 |  |  |
| Creating a 3D Model (using 3D solid) .....                     | 107 |  |  |
| Vpoint .....                                                   | 109 |  |  |
| Vports .....                                                   | 110 |  |  |
| User Coordinate System (UCS) .....                             | 111 |  |  |
| Dynamic UCS .....                                              | 112 |  |  |
| Variables to Control 3D Solid Triangulation and Isolines ..... | 113 |  |  |
| Visual Styles .....                                            | 113 |  |  |
| Creating of 3D Templates .....                                 | 115 |  |  |
| Interior (Master's Bed rm.) Composition .....                  | 120 |  |  |
| Other 3D Related Commands                                      |     |  |  |
| Helix .....                                                    | 122 |  |  |
| Sweep .....                                                    | 122 |  |  |
| Loft .....                                                     | 122 |  |  |
| Thicken .....                                                  | 122 |  |  |
| <b>LESSON XII</b>                                              |     |  |  |
| 2D/3D Section .....                                            | 123 |  |  |
| Live 3D Section .....                                          | 124 |  |  |
| To Generate Elevation .....                                    | 124 |  |  |
| <b>LESSON XIII</b>                                             |     |  |  |
| 3D Surface Model of a House .....                              | 125 |  |  |
| 3D Exterior Composition .....                                  | 126 |  |  |
| 3DFace .....                                                   | 127 |  |  |
| <b>LESSON XIV</b>                                              |     |  |  |
| 3D Orbit .....                                                 | 134 |  |  |
| Viewing a 3D Model .....                                       | 135 |  |  |
| Camera .....                                                   | 136 |  |  |
| <b>LESSON XV</b>                                               |     |  |  |
| XREF .....                                                     | 137 |  |  |
| <b>LESSON XVI</b>                                              |     |  |  |
| Tiled Vports and Floating Vports .....                         | 138 |  |  |
| Model Space and Layout .....                                   | 139 |  |  |
| Non-rectangular Viewports .....                                | 139 |  |  |
| Page Setup .....                                               | 140 |  |  |
| Final Composition .....                                        | 141 |  |  |
| <b>LESSON XVIII</b>                                            |     |  |  |
| Isosnap and Isocircle                                          |     |  |  |
| Snapstyle .....                                                | 157 |  |  |
| Creating Isocircle .....                                       | 157 |  |  |
| Creating a Plumbing Layout .....                               | 158 |  |  |


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**LESSON XVII**

|                                 |     |
|---------------------------------|-----|
| Color Rendering .....           | 145 |
| Assigning Colors .....          | 146 |
| Assigning Materials .....       | 147 |
| Tiling of Materials .....       | 148 |
| Saving of Render Image .....    | 148 |
| Fog Effect .....                | 149 |
| Image Size and Resolution ..... | 149 |
| Image Background .....          | 150 |
| Assigning Lights .....          | 151 |
| Sun Study .....                 | 154 |
| Animation .....                 | 155 |

**LESSON XIX**

|                                                 |     |
|-------------------------------------------------|-----|
| Hardware Setup .....                            | 159 |
| Plotting Procedure .....                        | 159 |
| Configuring AutoCAD Preferences .....           | 160 |
| To Configure a Local, Non- system Plotter ..... | 161 |
| To Create Color Dependent Plot Style .....      | 162 |
| Page Setup .....                                | 163 |

**SPECIAL LESSON**

|                                               |     |
|-----------------------------------------------|-----|
| Displaying Drawing Properties .....           | 164 |
| Importing Text .....                          | 164 |
| Filtering Layers .....                        | 165 |
| Slide Show .....                              | 166 |
| Hyperlinks .....                              | 167 |
| Saving objects to other file format .....     | 168 |
| Creating a 3D Studio File .....               | 168 |
| Managing Sheet Set .....                      | 169 |
| Pasting Table Data from Microsoft Excel ..... | 171 |
| Dview Command .....                           | 172 |
| 3D Surface Command .....                      | 175 |
| Basic Windows .....                           | 176 |

**Autocad Quick Reference**

|                                    |     |
|------------------------------------|-----|
| Toolbars .....                     | 181 |
| Coordinate Entry .....             | 183 |
| Workspace .....                    | 184 |
| To change Keyboard Shortcuts ..... | 185 |
| Object Selection .....             | 186 |

**Exercises**

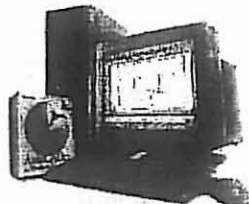
|                                |     |
|--------------------------------|-----|
| Coordinates .....              | 187 |
| Offset and Trim .....          | 188 |
| Isometric .....                | 189 |
| Mechanical Drawings .....      | 190 |
| Detailings .....               | 191 |
| Lighting Switch Layout .....   | 194 |
| Convenience outlet .....       | 194 |
| Waste Line piping Layout ..... | 195 |
| Water Line Layout .....        | 195 |
| Architectural Layout .....     | 196 |

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## Electronic Data Processing (EDP)

- Hardware** - refers to the computer itself and peripherals  
**Software** - refers to program and data  
**Peopleware** - refers to the user / operator

### COMPUTER HARDWARE (Parts and History)



IBM/PC or PC compatible.

- A. Systems Unit** - A box shape part of computer containing the computer's CPU (*Central Processing Unit*) motherboard, interface cards, simm rams, data storage device & drives. The most popular models is Pentium 4. The PC AT's were obsolete model and were popular during the 80's.

### Development of IBM-PC / compatible computers

- I. 80286 model** - a clone of IBM's AT which was based on Intel 80286 microprocessor and can address 16 MB of memory, but it was always operated with PC or MS DOS (obsolete).
- II. 80386 Model** - a computer built around an 80386 microprocessor. It uses the same bus (internal communications system) as an 80286 machine. An 80386 CPU, due to hardware design, limits physical memory to 16 MB.
  - a. 80386-Sx
  - b. 80386-Dx
- III. 80486 model** - a computer built around an 80486 microprocessor. Data transfer was 32 bits per cycle, it had a built-in math-coprocessor and can accommodate 8MB cache. An 80486 can address 64 MB of physical memory (obsolete).
  - a. 80486 Dlc no math-co
  - b. 80486-Sx no math-co
  - c. 80486-Dx built-in math-co
  - d. 80486-Dx2 built-in math-co
- IV. Pentium 450 MHz to 1 GHz**, latest P IV has 512k 2 level cache. It has an Intel speed step technology. Which allows faster internet communication & amazing 3D display & animation. The PIII 1GHz is equipped with an advance 0.18 micron processor.

## B. Input Devices

- 1. Keyboard** - It is a primary input device for every computer. Used for entering commands and texts, although this medium of data entry is limiting to a non-typist user.



mouse



Track ball

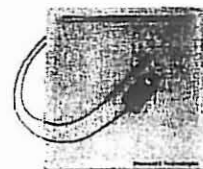
- 2. Mice** - small square devices with a cord connecting to the computer which use the table top to point to various objects and menus on the screen. They are functional for computer-aided design, free-form drawing, setting margins and tabs in word processing.



Cursor (puck)



Stylus pen



Digitizer with stylus pen and cursor (puck)

- 3. Digitizer** - Tablets used in combination w/ a puck, lightpen or stylus. Great for computer aided design and engineering.
- 4. Joystick** - Popular for playing computer games. It can be moved in several directions.
- 5. Touch Screens** - Works by merely pointing your finger at something on the screen. They work well for pictorial images, but not for text.
- 6. Lightpens** - Pen shaped devices used to point objects & menus on screen. Used in CAD systems.
- 7. Touchpads** - Most common device in a laptop PC computer. It can be also seen in commercial uses like in automatic banking machines, appliances, and as key replacement for traditional cash register keys.
- 8. Barcodes Scanners** - used to scan UPC codes to enter and automatically print out item names & prices. They can also be used for inventory tracking systems and for education.



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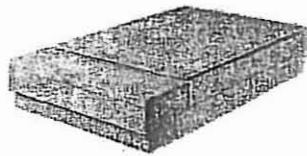
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AutoCAD





full bed scanner

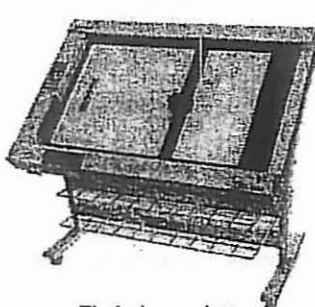
9. **Scanners** - Digitize image (photograph) into a bitmap file. For converting drawings into raster file. Scanners come in different sizes, from a hand scanner to an E-size equipment.

10. **Voice Input** - Works for a single user system, and for applications with a limited vocabulary.

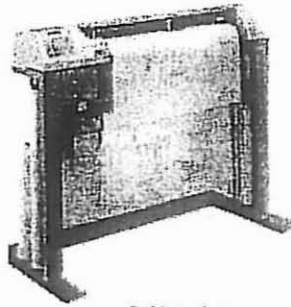
### Printing Hardware Devices



HP Laser printer



Flatbed pen plotter



Inkjet plotter

1. **Dot Matrix Printers** - form letters out of a combination of dots. They are faster and less expensive than other type of printers. Uses ribbons for ink-source.

2. **Laser Printers** - offers a superb print quality, equal to typesetting, and a wide variety of font types & sizes. Laser printers are fast but quite expensive. Uses powder toner for ink-source.

3. **Inkjet** - Good print quality, cheaper than laser printers. Uses liquid toner for ink source.

3. **Plotters** Sizes ranges from A to E dimensions. Prints using different paper media, pen types and colors. They are essential for CAD.

Type of plotters are:

-**Large Format Inkjet Plotters** - It is the cheapest and widely used Large Format Plotter for CAD & poster output. It uses CMYK liquid toner, dye-based (for indoor) or pigmented (for outdoor - 6 months maximum.)

-**Large Format Laser Printers** - up to E-size output, and may produce hi-resolution color/mono prints.

-**Pen Plotters** - either Drum type (roller beds) or XY type (flatbed). Pen plotters had to 20 or more pens (ink pen/lead pen), though most software restricted the number to eight. Sizes ranges from A to E (obsolete).

-**Thermal Plotters** - no pens, no toners, and no noise. Thermals ranges from A to E; With resolutions up to 400 dpi and plots 10x faster than pen plotters. Thermal plotters use a special media.

-**Electrostatic Plotter** - process begins as the plotter electrically charges a special media, attaches toner to that charge, removes excess toner, then dries the plot. Vector images (line) are converted first into raster (dot) image before processing begins. Resolutions range from 200 dpi to 400 dpi, and most are D-E sizes (for outdoor display).

**Data Storage** - Anything where electronic data can be stored.



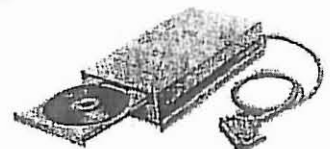
Floppy drives



8.0 GB Hard Disk



Tape drives



CD ROM with CD ROM drive

1. **RAM (Random Access Memory)** - is a primary storage media, a chip were installed in your PC board SIMM RAM (Single In-line Memory Module) measured in bytes. All data are temporary stored in this media and transfer later on a secondary storage media like floppy disk, hard disk or any medium where you can store and can be retrieve your data.



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2. **Floppy Disk** - Floppy disks come in two sizes. 5-1/4" (360 Kb & 1.2 Mb obsolete.) and 3-1/2" (720Kb & 1.44 Mb.) Floppy disks are made of polyurethane or Mylar and are covered with iron oxide. Floppy disk is housed with a protective flexible plastic jacket.
3. **Hard Disk** - A fixed disk drive installed inside your CPU or removable type. It offers a capacity of 4.3 - 8.4 (common size) to 21 gb. It stores and retrieves data much faster than floppy disk drive. The AT Hard Disk perform twice faster than XT's Hard Disk.
4. **Magnetic Tape** - Good as back-up storage of large data. It comes with a special drive, and access to data is usually sequential.

## SOFTWARES

### A. Application Softwares

Softwares used to solve some need of the user. They can either be purchased or custom written in programming languages (see programming languages for det.).

The following are main types of purchased softwares available in the market today

#### 1. Word Processing

Designed to replace function ordinarily performed on a type writer or manually, MS Word is an example of a popular word processing software today.

#### 2. Spreadsheet / Accounting Software

Used for applications otherwise performed with a pencil, calculator and accounting worksheet; Useful for budgeting, accounts payable/receivables, cash flow analysis. Microsoft Excel is a popular spread sheet package today.

#### 3. Computer Aided Design and Drafting

Used for design and drafting program of architectural, and engineering drawing. Popular softwares are AutoCAD, Intergraph, Draw Base, etc.

#### 4. Database

Used for organizing and presenting data in several manners, depending in purpose. Database management software packages includes Microsoft Access, dBASE & FoxPRO.

#### 5. Paint Program

Used to print/retouch photograph images, unlike CAD, most paint programs are for freehand Drawings, lesser in dimensional accuracy. Popular softwares are Corel

Photo Paint, Adobe Photoshop, Fractal Designs and PC Paint brush.

### 6. Desktop Publishing Software

Unlike a wordprocessor software, it provides a variety of fonts and is designed for page layouting. Desktop softwares are efficient alternative to manual typesetting in several cases. Popular softwares include PageMaker CorelDraw & Microsoft Publisher.

### 7. Integrated Software

A group of softwares performing several functions such as as word processing, spreadsheet calculation, presentation database management, graphics and data communication. Popular software includes MS Office.

### 8. Educational Software

Used in schools and Institution to enhance teaching of basic skills to students such as reading, math, spelling, geography, biology and history.

### B. Operating System Programs

Translate commands typed in by user into computer understandable terms (bits & bytes). The 3 main PC system programs are CP/M (Control Program for Microprocessor), MS-DOS (Microsoft Disk Operating System), Microsoft Windows 98 / 2000 / NT & PC-DOS (Personal Computer Disk Operating System).

### C. Network Software

Network Software and Hardware allow user to conduct and interchange information from PC to another PC computers. A Typical consists of a PC computer (Pentium or Higher processor type) as a host computer with up to 72 PC'S attached. Cost advantages to a network include shared software and printers, and less expensive terminals than a stand-alone system. Popular software are Windows NT, Novell and 3-Com.

### D. Communication Software

Used to share information between PC and a Mainframe or Minicomputer and Access "Public Bulletin Board" and "World Wide Web" for information such as stock reports, reservation, etc. Popular software includes Relay, smartcon, Crosstalk and Gateway.

### E. Programming Languages

Used for communication directions to the computer. A programmer does not normal write program in machine language but instead write them in a source language which will translated into a machine language for execution on the computer upon loading. Popular programming languages include Assembler, BASIC, C/C++, dBASE and Pascal.



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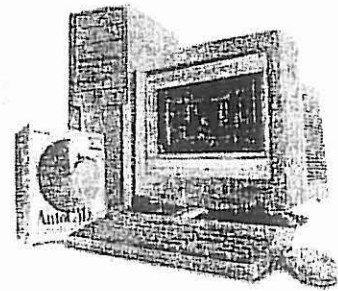
AutoCAD

## A: STEPPING INTO AUTOCAD

Listed below are the recommended system requirements for running this release of Autocad

System Requirements for AutoCAD 2007 for users that are focusing on 2D drawing creation are as follows:

|                    |                                                                                   |
|--------------------|-----------------------------------------------------------------------------------|
| Operating System   | : Microsoft Windows XP Professional, Home or Tablet PC Edition, Windows 2000 SP 4 |
| Browser            | : Microsoft Internet Explorer 6 SP 1 or higher                                    |
| Processor          | : Inter Pentium IV (recommended)                                                  |
| RAM                | : 512 MB                                                                          |
| Video              | : 1024 X 768 with True Color                                                      |
| Hard Drive         | : 750 MB (Installation)                                                           |
| Pointing Device    | : MS-mouse compliant                                                              |
| Installation Media | : CD-ROM (any speed for installation)                                             |



System Requirements for AutoCAD 2007 for users that are taking advantage of the new conceptual design capabilities are as follows:

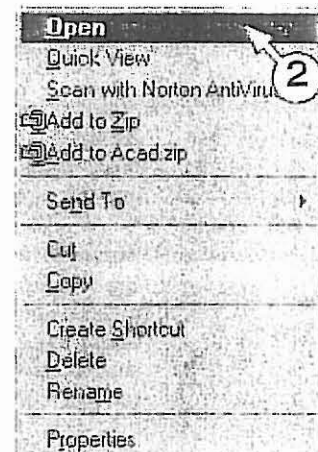
|                  |                                                                     |
|------------------|---------------------------------------------------------------------|
| Operating System | : Windows XP SP2                                                    |
| Processor        | : Inter Pentium IV - 3.0 GHz                                        |
| RAM              | : 2.0 GB or greater                                                 |
| Video            | : 1280 X 1024 32-bit color video display adapter with True Color    |
|                  | : 128 MB or greater, Open-GL capable workstation class graphic card |
| Hard Drive       | : 2.0 GB available not including installation                       |

## B: STARTING AutoCAD

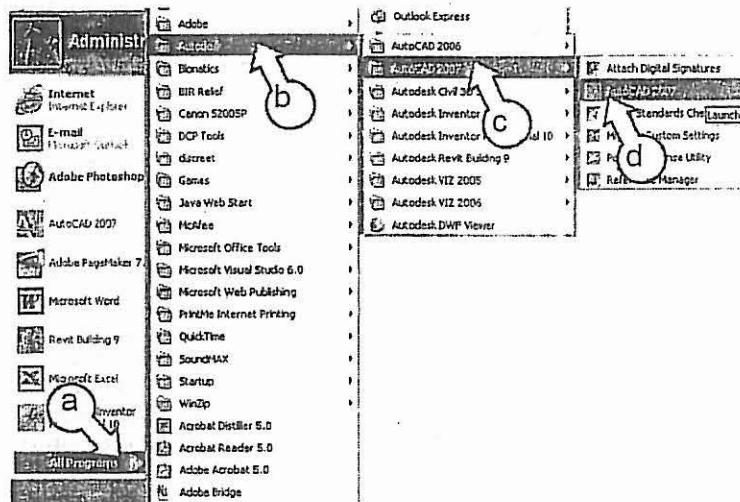
1. From the Desktop, double click the AutoCAD 2007 icon



2. From Desktop, Use right click on Autocad 2007 icon to display shortcut menu



3. From Start menu (Microsoft® Windows®), choose Programs. Then choose from the menu Autodesk, AutoCad 2007, AutoCAD 2007



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## C: SELECT TEMPLATE DIALOG BOX

Command: **STARTUP** (press enter)

Enter new value for STARTUP <1>: **0** (press enter)

Note:

0 - Don't show the start-up dialog

1 - Show the start-up dialog

## D: CREATE NEW DRAWING DIALOG BOX

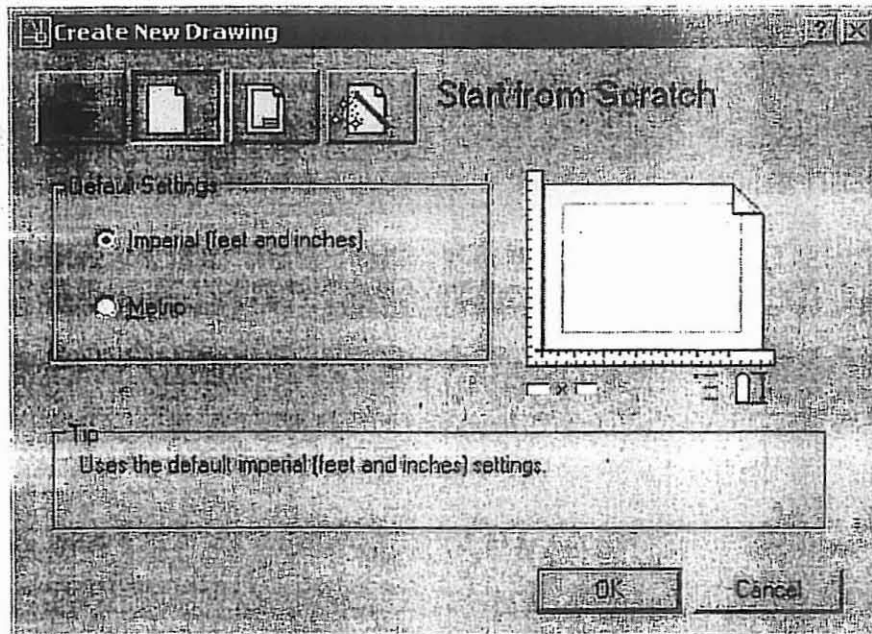


fig. III-1. showing Create New Drawing dialog box



**OPEN A DRAWING** : Opens a drawing you select from a list of the nine most recently opened drawings. Also, it displays the Browse button that you choose to look for another file.



**START FROM SCRATCH** : Opens a new drawing based on the measurement system you choose: Imperial\* (feet and inches) or Metric (millimeters).



**USE A TEMPLATE** : Opens a new drawing based on a template you select from a list. It displays template files (\*.dwt extension) that exist in the Drawing Template File location as specified in the Options dialog box. Templates files store all the settings for a drawing and can also include predefined layers, dimension styles, and views.



**USE A WIZARD** : Opens a new drawing that you set up using either the Quick Setup Wizard or the Advanced Setup Wizard.



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## E: UNDERSTANDING THE AUTOCAD USER INTERFACE

When you start Autocad, the Autocad window opens. The window is your design work space. It contains elements that you use to create your designs and to receive information about them. The following illustration shows the main parts of the Autocad Window:

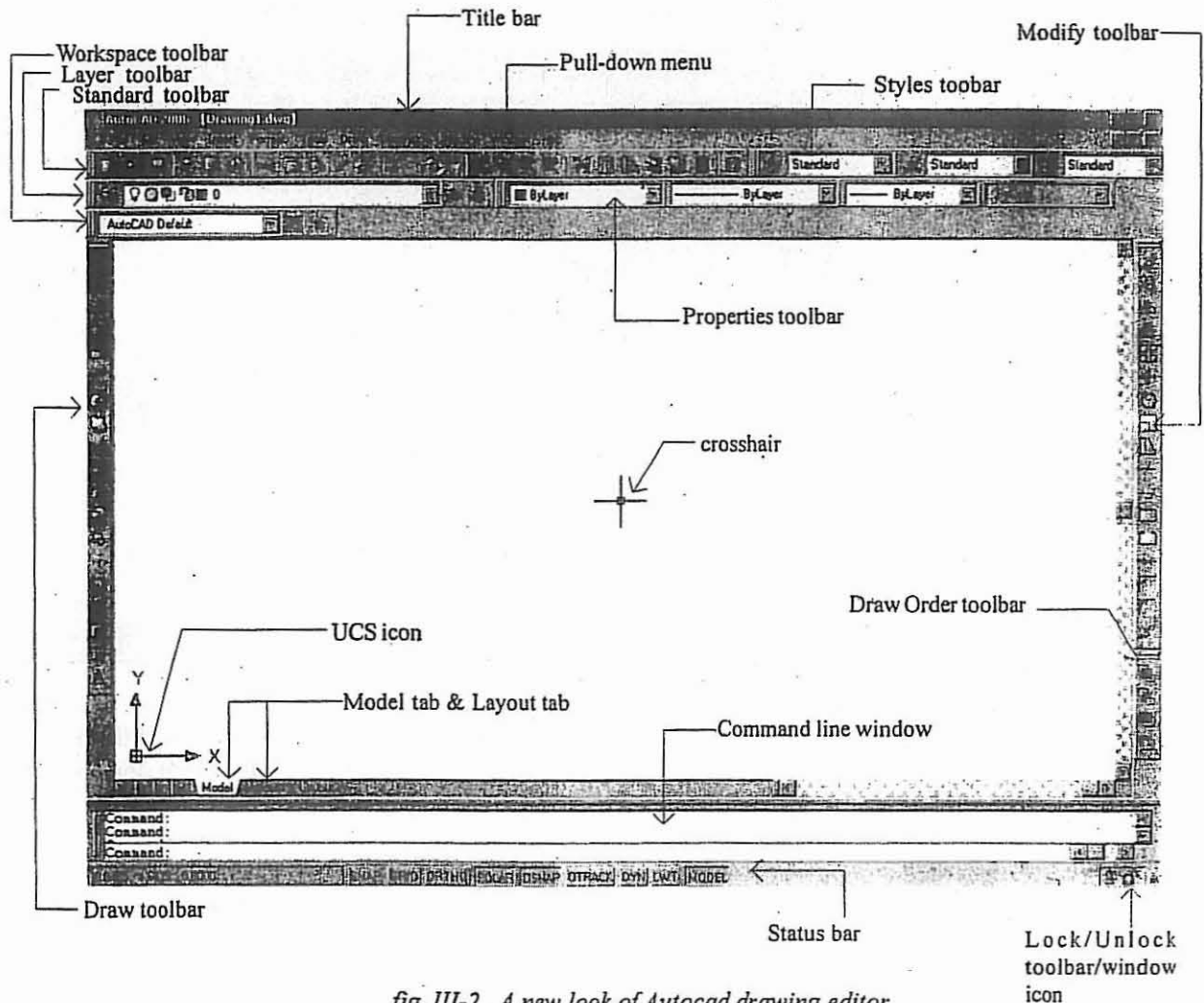


fig. III-2. A new look of Autocad drawing editor (default setting of toolbars)



The following is the process of using dialog box to set default setting of AutoCAD Toolbars:

1. Click **Options** from the shortcut menu.
2. In the Options dialog, click **Profiles** tab
3. Choose **Reset** button
4. Select **Yes**
5. Choose **OK**



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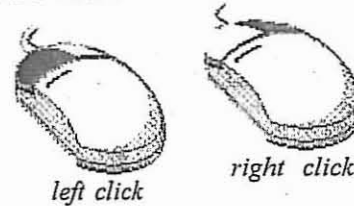
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## IV: USING BUTTON FUNCTIONS OF A MOUSE

### 1. Left Button

- Pick or Point button to specify a point location/position
- to select objects /commands/menus



### 2. Right Button / Right Click Shortcut

Rapid access is given to the available menu options. Different shortcut menus are available at different time.

**DEFAULT** - At the drawing area, with no command in progress, or selection set available, right click. (fig.III-3)

**EDIT MODE** - With objects selected, but no command in progress, right click. (fig.III-4)

**DIALOG MODE** - In modal dialogs, or in dialog tabs, right click. (fig.III-5)

**COMMAND MODE** - During a command in progress, right click. The menu displays the options specific to that command. (fig.III-6)

**RECENT COMMANDS** - At the command window, right click to display a shortcut menu of previous commands. (fig.III-7)

**MISCELLANEOUS** - In addition to the menus listed previously, access shortcut menus by right clicking on the Command line, on the toolbar, layout tabs, or the Status Bar. (fig.III-8)

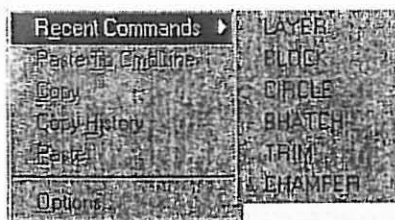


Fig.III-7. Recent commands

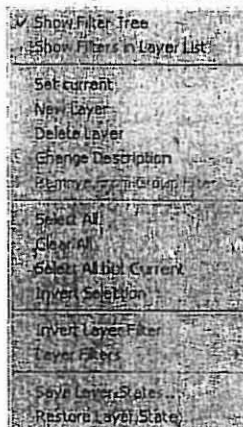


Fig.III-5. Dialog box

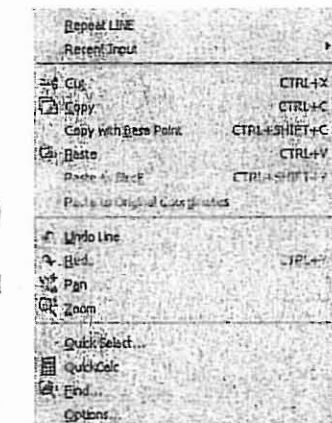


Fig.III-3. Default mode

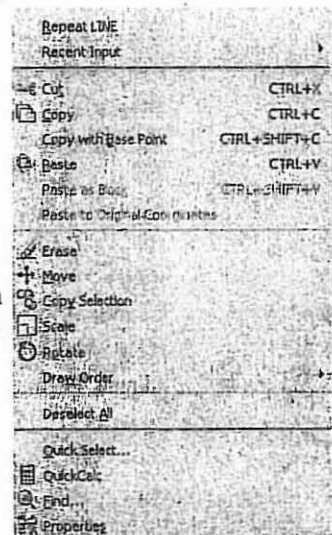


Fig.III-4. Edit mode



Fig.III-8 Miscellaneous mode @ Toolbar

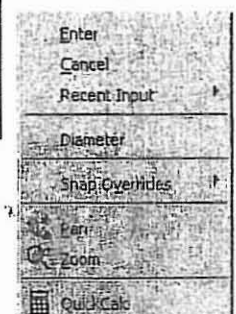


Fig.III-6. Command mode



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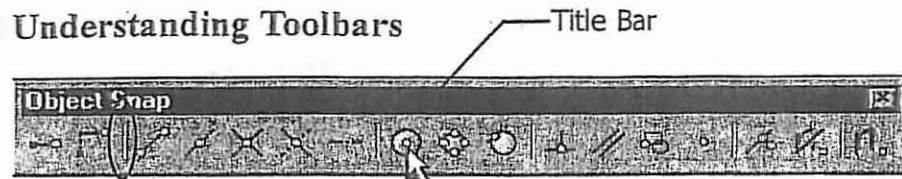
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## G: Understanding Toolbars



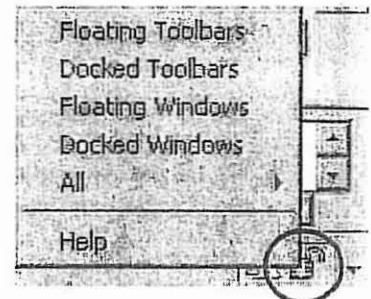
**COOLBAR**  
Coolbar is the name given to the animated behavior of the toolbars.

**Separator**  
A bar placed in a toolbar to separate command groups.

**ToolTip**  
A text string is displayed



**Grab Bar**  
Locate a Toolbar for relocation using grab bar.



**LOCK**  
-toggle lock/unlock of toolbars or windows  
Note: From *Window* menu >> *Lock Location*

## H: USING FUNCTION KEYS

| FUNCTION KEYS | DESCRIPTIONS                                                       |
|---------------|--------------------------------------------------------------------|
| F1 -          | Online Help                                                        |
| F2 -          | Switches between Graphics screen and Text screen ( <i>toggle</i> ) |
| F3 -          | Turns Osnap ON/OFF                                                 |
| F4 -          | Turns Tablet ON/OFF                                                |
| F5 -          | Cycles to Top, Right & Left Isoplanes                              |
| F6 -          | Turns Dynamic UCS ON/OFF                                           |
| F7 -          | Turns Grid ON/OFF                                                  |
| F8 -          | Turns Ortho ON/OFF                                                 |
| F9 -          | Turns Snap ON/OFF                                                  |
| F10 -         | Turns Polar Tracking ON/OFF                                        |
| F11 -         | Object Snap Tracking ON/OFF                                        |
| F12 -         | Turns Dynamic Input ON/OFF                                         |

## I: STATUS BAR



### Single click access

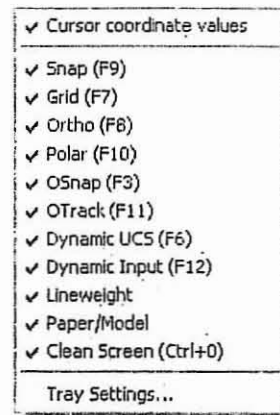
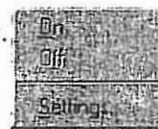
Use a single click to toggle On or Off settings.

### Right click

An associated dialog box is displayed



Press **Ctrl 9** to turn on/off the command line window



### Context menu

Each item has a menu that is displayed by right clicking the tool.



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## J: EXERCISE USING LINE

Exer. # 1 : Line and Ortho mode (F8)



**Command** : L (enter)  
**First Point** : pick pt. A  
**Next Point** : pick pt. B  
**Next Point** : pick pt. C  
**Next Point** : pick pt. D  
**Next Point** : pick pt. A  
**Next Point** : type C enter

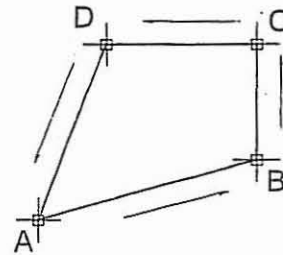


fig.III-9. Exercise 1 (line &amp; F8)

Exerc. # 2 : Using Different Selection Methods

Last  
 Pickbox  
 Window  
 Crossing  
 All

## a) Using Last

Selects the most recently created visible object.



**Command** : E (enter)  
**Select objects** : L (enter)  
**Select objects** : press enter

**Command** : OOPS (enter)  
 -restores objects erased by the last  
ERASE command.

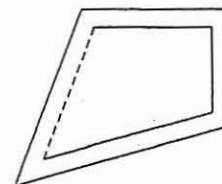


fig.III-10. Selecting objects

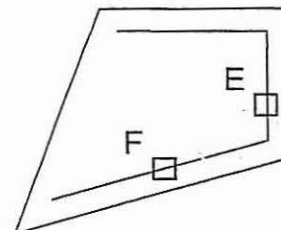
## b) Using Pickbox

A small box, called the pickbox, replaces the crosshairs on the graphics cursor. You can select objects individually with the pointing device.



**Command** : E (enter)  
**Select objects** : pick line E  
**Select objects** : pick line F  
**Select objects** : press enter

**Command** : PICKBOX (enter)  
 -to resize the pickbox



Pickbox will appear on-screen.  
 This will allow you to select  
 individual objects.



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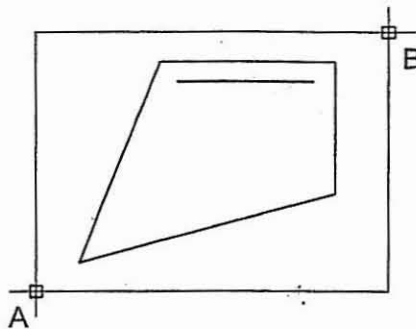
AutoCAD

### c) Using Window

Selects all objects completely inside a rectangle defined by two points. Specifying the corners from left to right creates a window selection.



Command : E (enter)  
Select objects : pick pt. A  
Opposite corner : pick pt. B  
Select objects : press enter

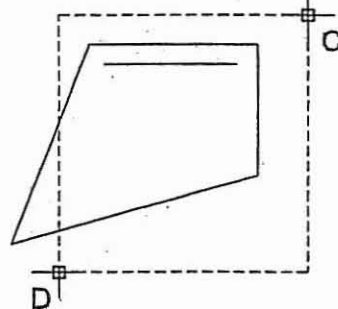


### d) Using Crossing

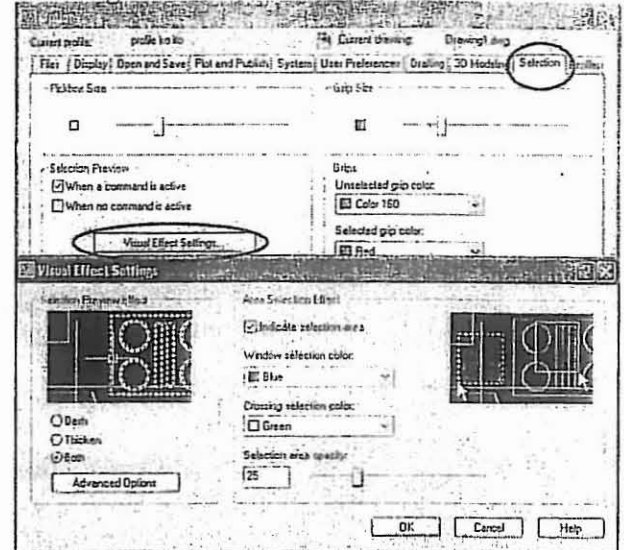
Selects objects within and crossing an area defined by two points. A crossing selection is displayed as dashed lines or otherwise highlighted to differentiate it from window selection. Specifying the corners from right to left creates a crossing selection.



Command : E (enter)  
Select objects : pick pt. C  
Opposite corner : pick pt. D  
Select objects : press enter



### To change the color of selection window



### e) Using All

Selects all objects (except objects in Locked or Frozen Layers)



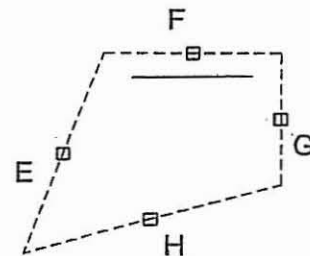
Command : E (enter)  
Select objects : ALL (enter)  
Select objects : press enter

### f) Using Undo

Cancels the selection of the object most recently added to the selection set.



Command : E (enter)  
Select objects : pick line E  
Select objects : pick line F  
Select objects : pick line G  
Select objects : pick line H  
Select objects : U (enter)  
Select objects : U (enter)  
Select objects : press enter



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**AutoCAD**



## K: AutoCAD COORDINATE SYSTEM

### 1. Absolute Coordinates

Specify a point by entering its X and Y values in the format X,Y (or X,Y,Z for 3D point). Use absolute X,Y coordinates when you know the precise X and Y values of the location of the point.

|                                                                                   |             |                    |
|-----------------------------------------------------------------------------------|-------------|--------------------|
|  | Command     | : <u>L (enter)</u> |
|                                                                                   | First Point | : <u>1,1</u>       |
|                                                                                   | Next Point  | : <u>6,1</u>       |
|                                                                                   | Next Point  | : <u>6,3</u>       |
|                                                                                   | Next Point  | : <u>4,4</u>       |
|                                                                                   | Next Point  | : <u>1,4</u>       |
|                                                                                   | Next Point  | : <u>C</u>         |

Exer #1 : Using Absolute Coordinate System

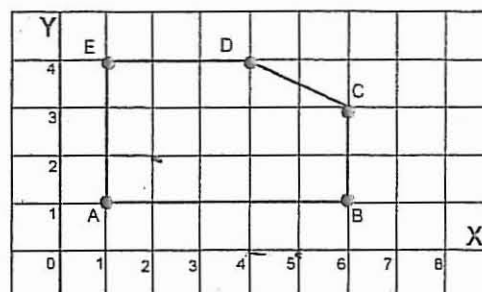
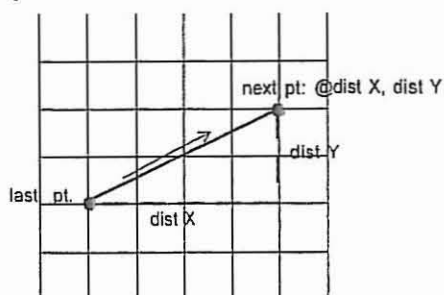


fig. III-11

### 2. Relative Coordinates

Specify a point relative to the X & Y distance from the last point in the format @X,Y (or X,Y,Z for 3D point), where @ is a relative last point or last point.



Exer #2 : Using Relative Rectangular Coordinates

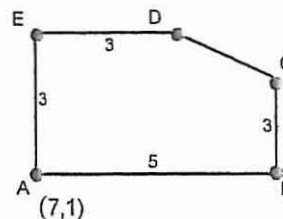


fig. III-12

|                                                                                     |             |                                         |
|-------------------------------------------------------------------------------------|-------------|-----------------------------------------|
|  | Command     | : <u>L (enter)</u>                      |
|                                                                                     | First Point | : <u>7,1 (absolute) or pick any pt.</u> |
|                                                                                     | Next Point  | : <u>@5,0</u>                           |
|                                                                                     | Next Point  | : <u>@0,2</u>                           |
|                                                                                     | Next Point  | : <u>@-2,1</u>                          |
|                                                                                     | Next Point  | : <u>@-3,0</u>                          |
|                                                                                     | Next Point  | : <u>C</u>                              |



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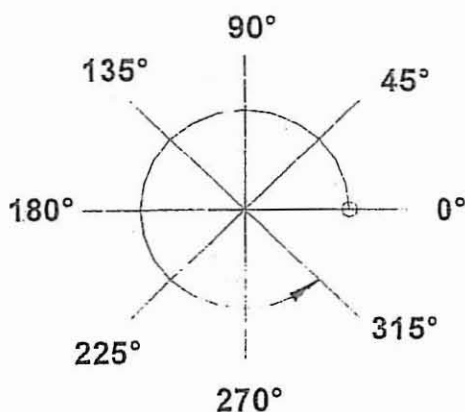
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**AutoCAD**

### 3. Relative Polar Coordinate

Specify a point by entering a distance and an angle relative to the last point in the format @Distance<Polar Angle.



Exer #3 : Using Relative Polar Coordinates

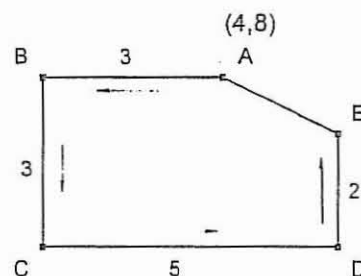


fig. III-13



Command : L (enter)  
 First Point : 4,8 (absolute) or pick any pt.  
 Next Point : @3<180  
 Next Point : @3<270  
 Next Point : @5<0  
 Next Point : @2<90  
 Next Point : C

### 4. Direct Distance Entry

Specify a point by moving your pointing device to the direction of the point and entering a distance



Ortho or Polar must be ON



Command : L (enter)  
 First Point : pick pt. A  
 Next Point : ← 3  
 Next Point : ↓ 3  
 Next Point : → 5  
 Next Point : ↑ 2  
 Next Point : C

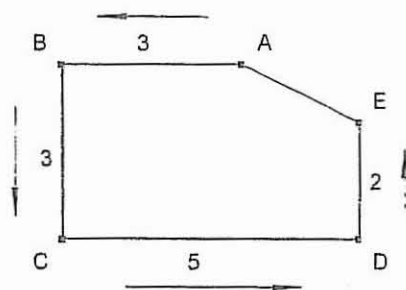


fig. III-14



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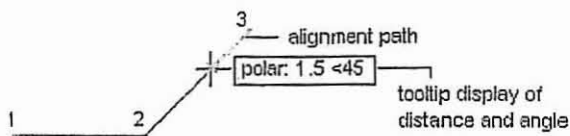
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### 5. Polar Tracking and Snap

Specify a point by moving your pointing device to the direction of the point and follows temporary alignment paths to locate point.



#### Exer #5 : Using Polar Tracking and Snap

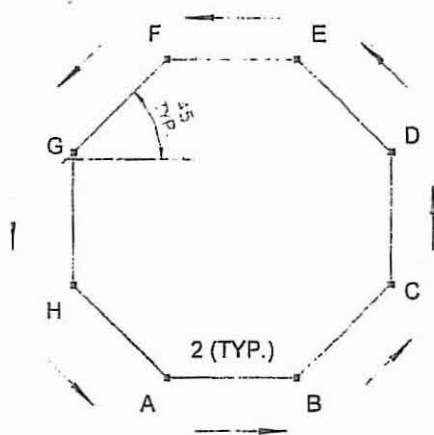
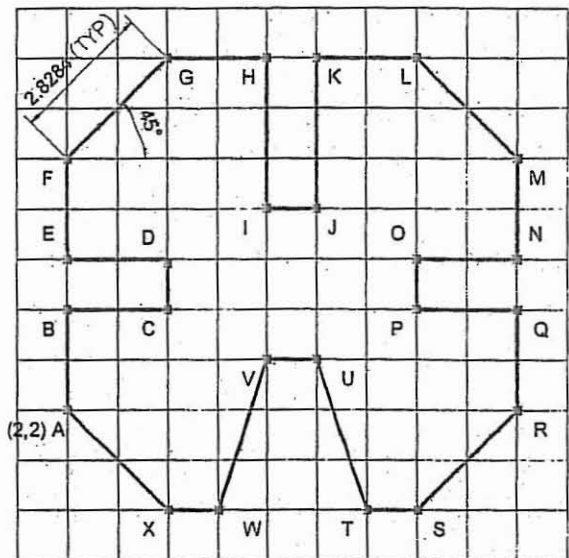


fig. III-15. Using Snap and Polar Tracking

- SNAP On  
Polar distance = 2.00
- POLAR On  
Increment Angle = 45
- LINE

Command : L (enter)  
 First Point : \_\_\_\_\_  
 Next Point : \_\_\_\_\_  
 Next Point : \_\_\_\_\_  
 Next Point : \_\_\_\_\_  
 Next Point : \_\_\_\_\_  
 Next Point : \_\_\_\_\_

#### Exer #5 : Combination of Methods



Command : L (enter)

First Point : (A) 2,2

Next Point : (B) @2<90

Next Point : (C) @2,0

Next Point : (D) 1 ↑

Next Point : (E) 2.4

Next Point : (F)

Next Point : (G)

Next Point : (H)

Next Point : (I)

Next Point : (J)

Next Point : (K)

Next Point : (L)

Next Point : (M)

Next Point : (N)

Next Point : (O)

Next Point : (P)

Next Point : (Q)

Next Point : (R)

Next Point : (S)

Next Point : (T)

Next Point : (U)

Next Point : (V)

Next Point : (W)

Next Point : (X)

Next Point : (Y)



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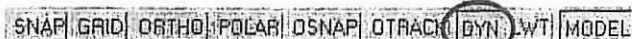
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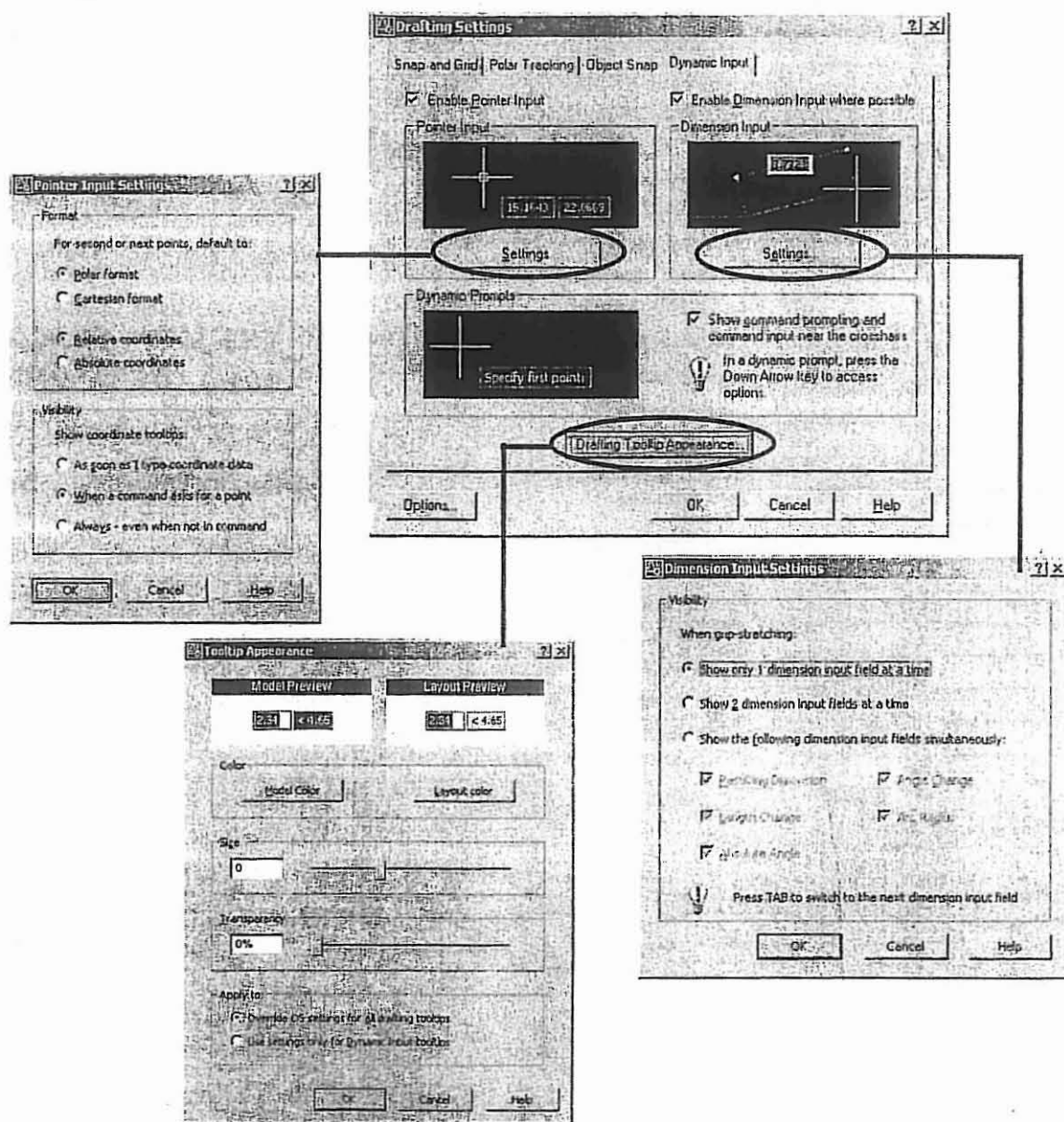
## DYNAMIC INPUT

Dynamic Input provides a command interface near the cursor to help you keep your focus in the drafting area. When Dynamic Input is on, tooltips display information near the cursor that is dynamically updated as the cursor moves. When a command is active, the tooltips provide a place for user entry.

A. To Turn on/off, click **DYN** button at the status bar or press F12.



B. To Configure, Right-click on **DYN** button at the status bar



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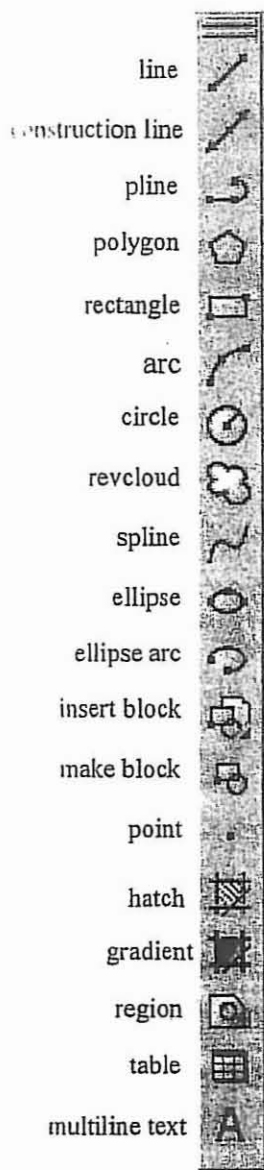
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## DRAW COMMANDS / TOOLS



## A. LINEARS

1. Line



2. Trace



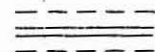
3. Pline



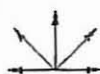
4. Sketch



5. Mline



6. Ray



7. Xline



## B. CURVES

1. Circle



2. Donut



3. Ellipse



4. Spline



5. Arc



6. Pline



7. Revcloud



## C. SPECIAL OBJECTS

1. Rectang



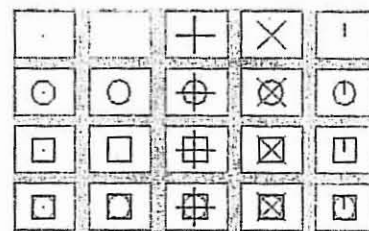
2. Polygon



3. Hatch/Bhatch



## D. POINT



## E. TEXT/DTEXT/MTEXT

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## F. TABLE

| Door No. | DOOR SCHEDULE |        | No. of Sets |
|----------|---------------|--------|-------------|
|          | Width         | Height |             |
| D1       | 1.00          | 2.10   | 1           |
| D2       | 0.80          | 2.10   | 5           |
| D3       | 0.80          | 2.10   | 0           |



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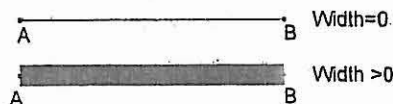
AutoCAD

**A: LINEARS****1. LINE**

Creates straight line segments  
With Close and Undo features.

**2. TRACE**

Creates solid lines, no Undo, and has  
no Close feature and hard to edit.



Exer. # 1: Draw a trace using width = 0.50

Command : Trace (enter)  
Specify trace width <> : 0.50  
Specify start point : pick pt. A  
Specify next point : @4<0  
Specify next point : @3<90  
Specify next point : @4<180  
Specify next point : @3<270  
Specify next point : press (enter)

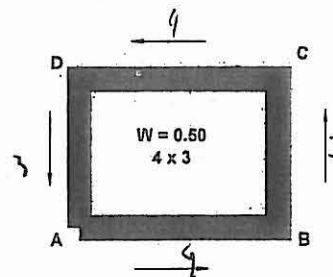


fig. IV-1. Using trace

**Supressing Solid Region (FILL)**

Command : Fill (enter)  
ON/OFF<ON> : OFF

Command : REgen (enter)

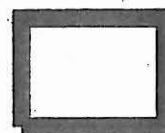


fig. IV-2. Fill mode = on

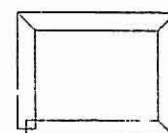


fig. IV-3. Fill mode = off

**3. PLINE (POLYLINE)**

Draws line and arc segments that form a single object.

Exer. #2: Draw a 4 x 3 rectangle using Pline, width = 0

- TYPE  
PLINE/ENTER

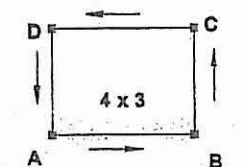


fig. IV-4. Pline width = 0

Arc  
Close  
Halfwidth  
Length  
Undo  
Width

**POLYLINE**  
shortcut menu

Angle  
Center  
Close  
Direction  
Halfwidth  
Line  
Radius  
Second pt  
Undo  
Width



Command : PL (enter)  
From point : pick pt. A  
Current line-width is 0.0000  
Specify next point or [Arc/Close/Halfwidth/Length/Undo/Width] : @4<0  
Specify next point or [Arc/Close/Halfwidth/Length/Undo/Width] : @3<90  
Specify next point or [Arc/Close/Halfwidth/Length/Undo/Width] : @4<180  
Specify next point or [Arc/Close/Halfwidth/Length/Undo/Width] : C

LINEARS

CURVES



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Exer. # 3: Draw a pline using line, arc and width options

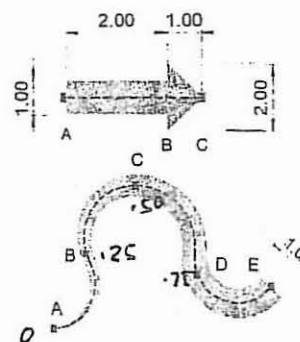
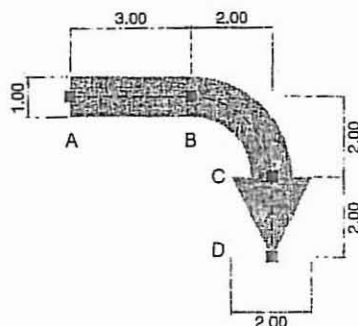


fig. IV-5. Pline using starting and ending width



Command : **PL (enter)**  
 From point : **pick any pt.**  
 Current line-width is 0.0000  
 Specify next point or [Arc/Close/Halfwidth/Length/Undo/Width] : **W (enter)**  
 Specify starting width <0.00> : **1.00**  
 Specify ending width <1.00> : **1.00**  
 Specify next point or [Arc/Close/Halfwidth/Length/Undo/Width] : **@3<0**  
 Specify next point or [Arc/Close/Halfwidth/Length/Undo/Width] : **A (enter)**  
 [Angle/Center/Close/Direction/Halfwidth/Line/Radius/Second pt/Undo/Width] : **@2,-2**  
 [Angle/Center/Close/Direction/Halfwidth/Line/Radius/Second pt/Undo/Width] : **W (enter)**  
 Specify starting width <0.00> : **2.00**  
 Specify ending width <1.00> : **0**  
 [Angle/Center/Close/Direction/Halfwidth/Line/Radius/Second pt/Undo/Width] : **L (enter)**  
 Specify next point or [Arc/Close/Halfwidth/Length/Undo/Width] : **@2<270**  
 Specify next point or [Arc/Close/Halfwidth/Length/Undo/Width] : **press enter**

#### 4. SKETCH

Command for freehand drawing, comprising of small line segments. Sketch is useful for entering small map outlines, signatures, or other freehand drawings.



set **SKPOLY = 1**; **SKPOLY** - controls whether sketch draws lines as individual line objects (0) or as polylines (1)

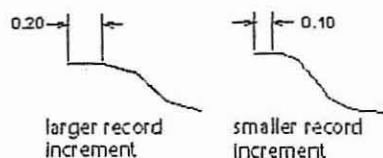


fig. IV-6. Using sketch with F8=on/off

Exer. # 4: Using Sketch

Command : **SKETCH (enter)**  
 Record increment <0.1000>: **(enter)**  
 Pen eXit Quit Record Erase Connect : \_\_\_\_\_  
 Pen eXit Quit Record Erase Connect : \_\_\_\_\_  
 Pen eXit Quit Record Erase Connect : \_\_\_\_\_



**Pen (Pick Button)**

Raises and lowers the sketching pen.  
 The pen must be raised before you can select menu items with the pointing device.

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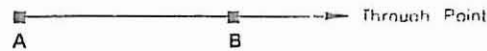
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**5. MLINE**

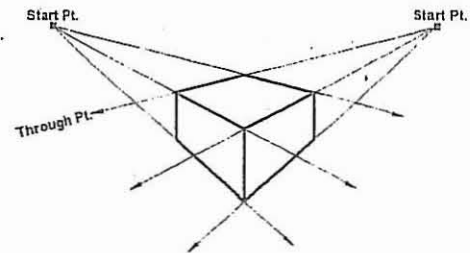
Creates multiple parallel lines (see page 102)

**6. RAY**

Creates semi-infinite lines commonly used as construction lines. A ray has a finite starting point and extends to infinity.

**Exer. # 5: Using Ray**

Command : RAY (enter)  
 Specify start point : \_\_\_\_\_  
 Specify through point : \_\_\_\_\_  
 Specify through point : \_\_\_\_\_  
 Specify through point : \_\_\_\_\_

**7. XLINE**

Creates infinite lines, which are commonly used as construction lines.

**Exer. # 6: Using xline****HORIZONTAL**

Command : XL (enter) (see fig.IV-8)  
 Specify a point or [Hor/Ver/Ang/Bisect/Offset] : H (enter)  
 Specify through point : pick any point  
 Specify through point : pick any point  
 Specify through point : press enter

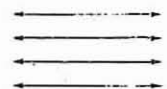
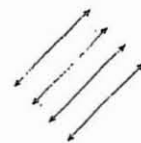
**VERTICAL**

Command : XL (enter) (see fig.IV-9)  
 Specify a point or [Hor/Ver/Ang/Bisect/Offset] : V (enter)  
 Specify through point : pick any point  
 Specify through point : pick any point  
 Specify through point : press enter

**ANGLE**

Command : XL (enter) (see fig.IV-10)  
 Specify a point or [Hor/Ver/Ang/Bisect/Offset] : A (enter)  
 Enter angle of xline (0) or [Reference] : 45  
 Specify through point : pick any point  
 Specify through point : pick any point  
 Specify through point : press enter

Hor  
 Ver  
 Ang  
 Bisect  
 Offset

fig. IV-7. Showing Xline  
shortcut menufig.IV-8  
Using Horfig. IV-9  
Using Verfig. IV-10  
Using Ang**MICROCADD TECHNOLOGIES CO.****MAIN OFFICE**Suite 500 Dona Consolacion Bldg  
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## B: CURVES

## 1. CIRCLE

You can create circles in several ways. The default option is to specify the center and radius. You can also specify the center and diameter or define the diameter alone with two points. You can define the circle's circumference with three points. You can also create a circle tangent to three existing objects or create it tangent to two objects and specify a radius

## OPTIONS

- A. Center, Radius
- B. Center, Diameter
- C. 2Points
- D. 3Points
- E. Tan, Tan, Rad
- F. Tan, Tan, Tan

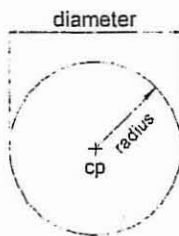


fig. IV-11. Using Center+ radius

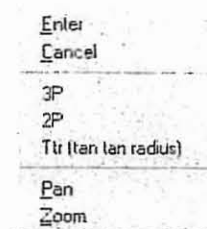


fig. IV-12. Showing shortcut menu

Exer. # 1



Command : C (enter) (see fig. IV-13)  
Specify center point for circle or [3P/2P/Ttr (tan tan radius)]: pick cp  
Specify radius of circle or [Diameter] : 1.00

Exer. # 2



Command : C (enter) (see fig. IV-14)  
Specify center point for circle or [3P/2P/Ttr (tan tan radius)]: pick cp  
Specify radius of circle or [Diameter] : D  
Specify diameter of circle <2.0000> : 1.75

Exer. # 3



Command : C (enter) (see fig. IV-15)  
Specify center point for circle or [3P/2P/Ttr (tan tan radius)]: 2P  
Specify first end point of circle's diameter : pick A  
Specify second end point of circle's diameter : pick B  
or @2<0

Exer. # 4



Command : C (enter) (see fig. IV-16)  
Specify center point for circle or [3P/2P/Ttr (tan tan radius)]: 3P  
Specify first point on circle : pick A  
Specify second point on circle : pick B  
Specify third point on circle : pick C

Exer. # 5



Command : C (enter) (see fig. IV-17)  
Specify center point for circle or [3P/2P/Ttr (tan tan radius)]: TTR  
Specify point on object for first tangent of circle : pick tan A  
Specify point on object for second tangent of circle : pick tan B  
Specify radius of circle <1.8052> : 1.00

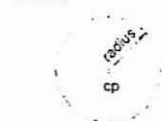


fig. IV-13. Radius



fig. IV-14. Diameter

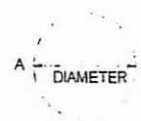


fig. IV-15. 2Point



fig. IV-16. 3Point



fig. IV-17. TTR



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## Exer. # 6



Command : (from DRAW pulldown menu, click Circle >> Tan,tan,tan) C\_

Specify first point on circle : pick A

Specify second point of circle : pick B

Specify third point on circle : pick C

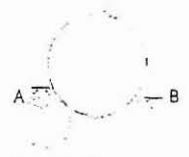


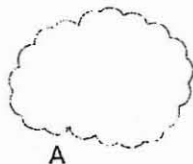
fig. IV-18. TTT

## 2. REVCLOUD

Creates a polyline of sequential arcs to form a cloud-shaped object.



You can select a style for a revision cloud: Normal or Calligraphy. If you select Calligraphy, the revision cloud looks as if it was drawn with a calligraphy pen.



A

fig. IV-19. Normal Revcloud



A

fig. IV-19a. Calligraphy Revcloud

## Exer. # 7



Command : REVCLOUD (enter) (see fig. IV-19)

Minimum arc length: 0.5000 Maximum arc length: 0.5000 Style: Normal

Specify start point or [Arc length/Object/Style] <Object> : pick pt. A

Guide crosshairs along cloud path...

## 2. DONUT

Draws filled circles and rings



A donut is a close polyline composed of wide arc segments. How AutoCAD fills the interior of a donut depends on the current setting of FILL command.

Exer. # 8: Inside Diameter = 1 Outside Diameter = 3

Command : DO (enter)

Specify inside diameter of donut <0.5000> : 1.00

Specify outside diameter of donut <1.0000> : 3.00

Specify center of donut or <exit> : pick any point

Specify center of donut or <exit> : press enter



fig. IV-20. Inside diameter &gt; 0

Exer. # 9: Inside Diameter = 0 Outside Diameter = 3

Command : DO (enter)

Specify inside diameter of donut <0.5000> : 0

Specify outside diameter of donut <1.0000> : 3.00

Specify center of donut or <exit> : pick any point

Specify center of donut or <exit> : press enter



fig. IV-21. inside diameter = 0



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### 3. SPLINE

Creates a quadratic or cubic spline (NURBS) curve

- ☞ SPLINE fits a smooth curve to a sequence of points within a specified tolerance. AutoCAD uses NURBS (nonuniform rational B-splines) mathematics, which stores and defines a class of curve and surface data.

Exer. # 10: Use spline to create curves



fig.IV-22. Entering points



Command : SPL (enter)

Specify first point or [Object] : pick pt. A

Specify next point : pick pt. B

Specify next point or [Close/Fit tolerance] <start tangent> : pick pt. C

Specify next point or [Close/Fit tolerance] <start tangent> : pick pt. D

Specify next point or [Close/Fit tolerance] <start tangent> : pick pt. E

Specify next point or [Close/Fit tolerance] <start tangent> : press enter

Specify start tangent : pick or press enter

Specify end tangent : pick or press enter

### 4. ELLIPSE

Creates an Ellipse or an elliptical arc

- ☞ If PELLIPSE = 1, ellipse is a pline representation  
 If PELLIPSE = 0, ellipse is a true ellipse object

use ELLIPSE + Isocircle to create isometric circles (for isometric drawing only).

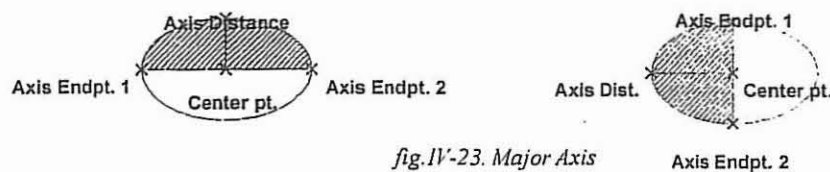


fig.IV-23. Major Axis

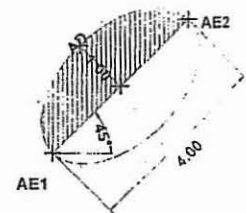


Command : EL (enter)

Specify axis endpoint of ellipse or [Arc/Center] : pick pt. A

Specify other endpoint of axis : @4.00<45

Specify distance to other axis or [Rotation] : 1.00



### 5. ARC

Creates an arc (SEE PAGE 35)



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## C: SPECIAL OBJECTS

### 1. RECTANG

A pline entity. Rectang command draws rectangular object. The two specified points determine the diagonal corners of a rectangle with sides parallel to the X and Y axis.

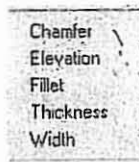


fig. IV-24. Showing RECTANG Options

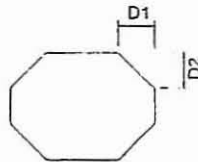


fig. IV-25. Rectang using Chamfer



fig. IV-26. Rectang using Fillet

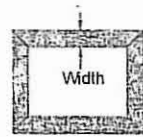
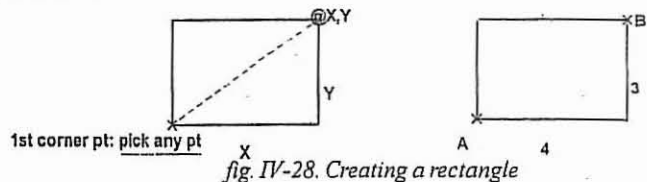


fig. IV-27. Rectang using Width

Exer. # 1: Draw a 4x3 Rectangle, width=0



Command : **REC** (enter)

Specify first corner point or [Chamfer/Elevation/Fillet/Thickness/Width]

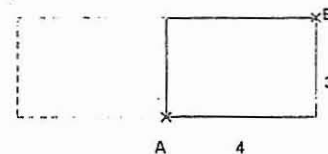
Specify other corner point or [Area/Dimensions/Rotation]:

: pick any point

: @, x,y or pick

any corner point

Exer. # 2 : Draw a 4x3 Rectangle, using DIMENSION option



Command : **REC** (enter)

Specify first corner point or [Chamfer/Elevation/Fillet/Thickness/Width]

Specify other corner point or [Dimensions]

Specify length for rectangles <4.0000>

Specify width for rectangles <3.0000>

Specify other corner point or [Dimensions]

: pick any point

: D

: 4

: 3

: pick any point

Exer. # 3 : Draw a Rectangle with an Area of 12. Factors are 4 and 3, 6 and 2, 12 and 1

Command: **REC** (enter)

Specify first corner point or [Chamfer/Elevation/Fillet/Thickness/Width]

Specify other corner point or [Area/Dimensions/Rotation]

Enter area of rectangle in current units <100.0000>

Calculate rectangle dimensions based on [Length/Width] <Length>

Enter rectangle length <10.0000>

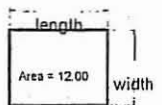
: pick any point

: A

: 12

: L

: 4



Exer. # 4 : Draw a Rectangle with an Area of 12 and Rotated by 45 degrees



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## 2. POLYGON

A polyline entity. Polygon command draws 2D polygons with 3 to 1024 sides. All sides are equal and equidistant from the center.

Exer. # 1: Draw a Polygon using Circumscribed (see fig.IV-29)

Command : POL (enter)  
 POLYGON Enter number of sides <4> : press enter  
 Specify center of polygon or [Edge] : pick any point  
 Enter an option [Inscribed in circle/Circumscribed about circle] <I> : C  
 Specify radius of circle : 2.00



fig. IV-29. Using circumscribed

Exer. # 2: Draw a Polygon using Inscribed (see fig.IV-30)



Command : POL (enter)  
 POLYGON Enter number of sides <4> : press enter  
 Specify center of polygon or [Edge] : pick any point  
 Enter an option [Inscribed in circle/Circumscribed about circle] <C> : I  
 Specify radius of circle : 'cal  
 Initializing...>> Expression : sqrt(8)

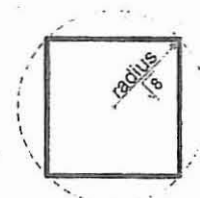


fig.IV-30. Using inscribed

Exer. # 5: Draw a Polygon using Edge (see fig.IV-31)

Command : POL (enter)  
 Enter number of sides <4> : 5  
 Specify center of polygon or [Edge] : E  
 Specify first endpoint of edge : pick any point  
 Specify second endpoint of edge : @2<0

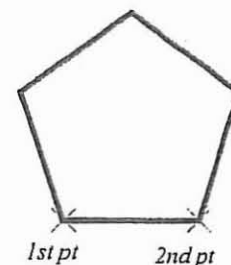


fig.IV-31. Using Edge



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#### 4. HATCH/BHATCH

Fills an enclosed area or selected objects with a hatch pattern, solid fill, or gradient fill (pline, 3Dface, etc.). A hatch pattern acts as one unit, unless when it's exploded.

##### Types of Hatch Pattern :

1. User defined - Creates a pattern of lines based on the current linetype in your drawing. You can control the angle and spacing of the lines in your user-defined pattern.
2. Predefined - Specifies a stored predefined AutoCAD pattern. You can control the angle and scale of any stored pattern.
3. Custom - Specifies a pattern that is defined in any custom .PAT file that you have added to the AutoCAD search path.

##### User defined



fig. IV-30. Single hatch

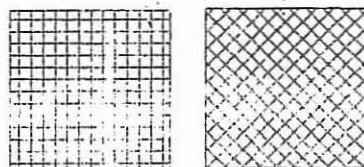
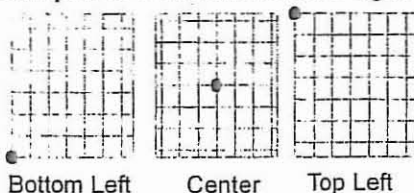


fig. IV-31. Double hatch

(Acad 2006 only)

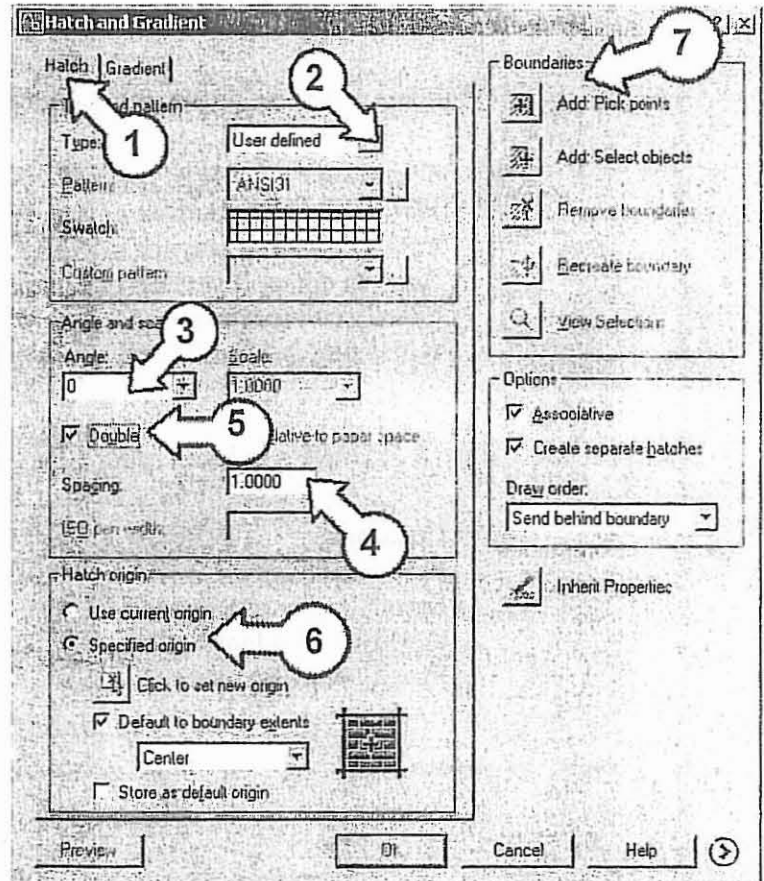
##### Samples of Different Hatch Origin



Bottom Left

Center

Top Left



Command: **FILL**

Enter mode [ON/OFF] <ON>: **ON**

Command: **B** or **BHATCH**(press enter)



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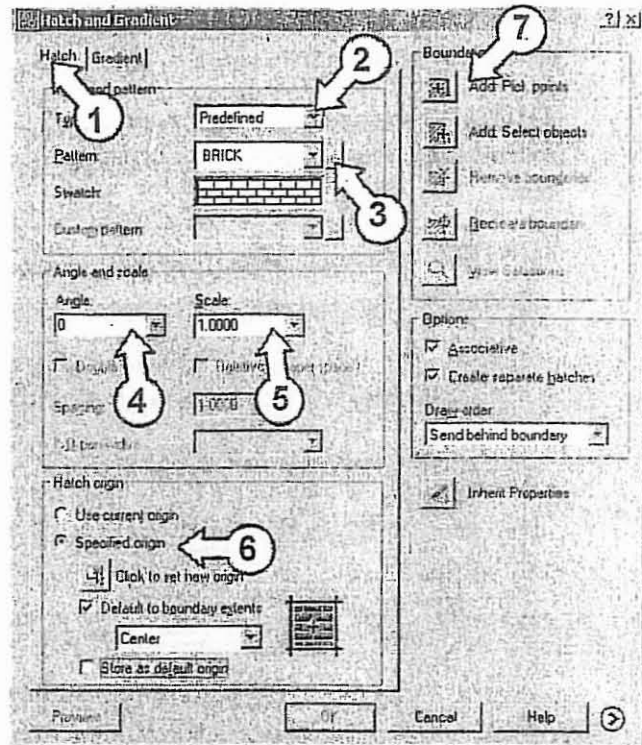
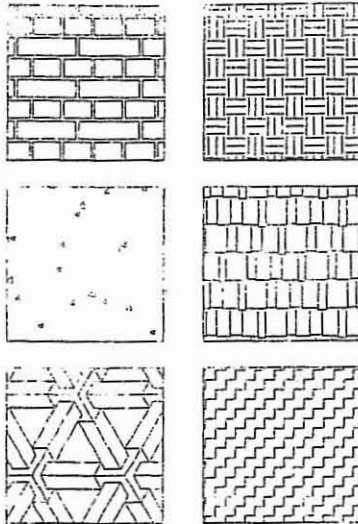
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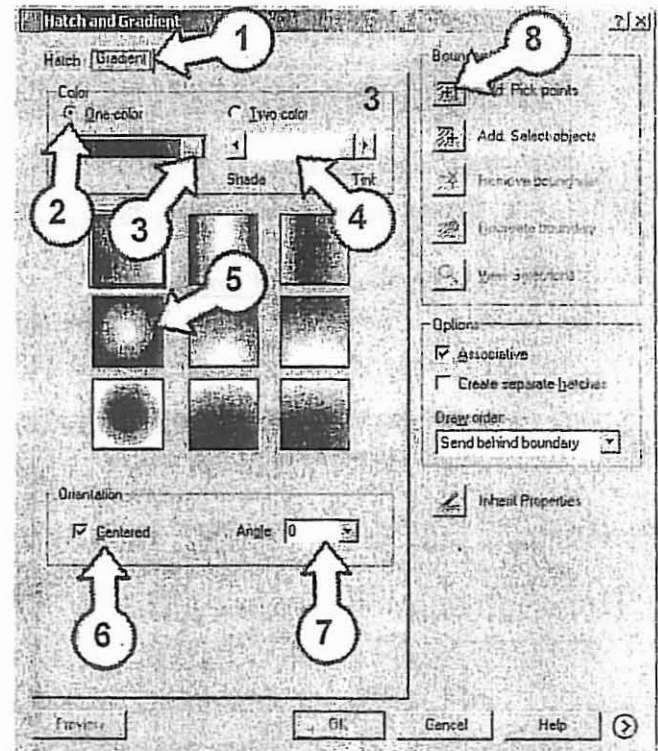
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### Predefined



A gradient fill is a solid hatch fill that gives the blended-color effect of a surface with light on it. You can use gradient fills to suggest a solid form in two-dimensional drawings.

The color in a gradient fill makes a smooth transition from light to dark, or from dark to light, and back. You select a predefined pattern (for example, linear, spherical, or radial sweep) and specify an angle for the pattern. In a two-color gradient fill, the transition is both from light to dark and from the first color to the second.



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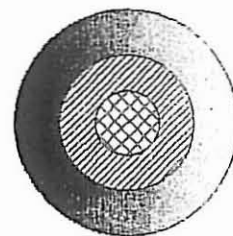
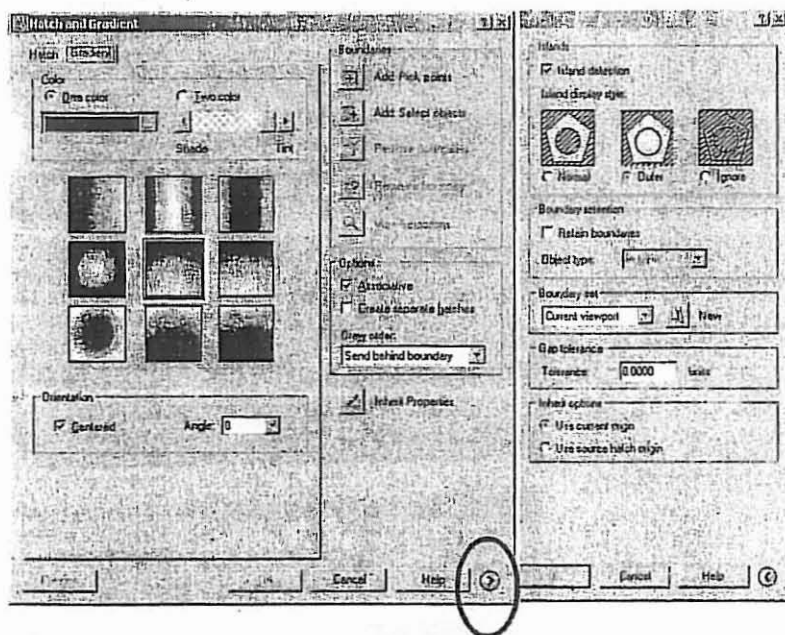


**Island Detection Style**

**NORMAL** -Hatches or fills inward from the outer boundary. If HATCH encounters an internal island, it turns off hatching or filling until it encounters another island within the island.

**OUTER** - Hatches or fills inward from the outer boundary. HATCH turns hatching or filling off if it encounters an internal island. This option hatches or fills only the outermost level of the structure and leaves the internal structure blank.

**IGNORE** -Ignores all internal objects and hatches or fills through them.



Using Outer Island Detection style

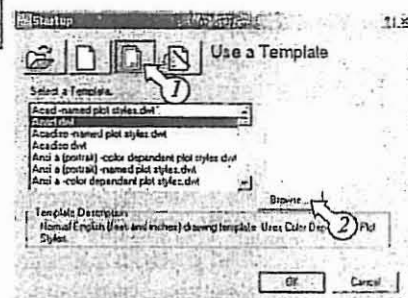
**Exercise #1: Applying Hatch**

- a.) Create a new drawing using *Toilet.dwt* template file



Command: **NEW** (enter)

(click Use a Template icon, then Browse...)



- b.) Applying hatch/bhatch command for floor tiles and solid-filled walls

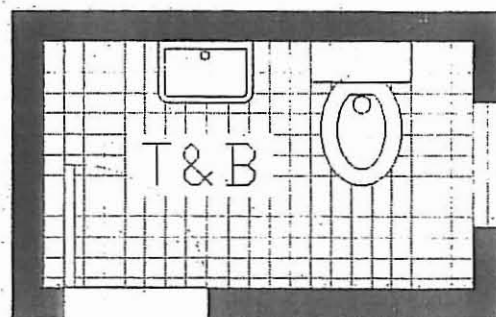


fig. 1 showing Toilet after applying HATCH

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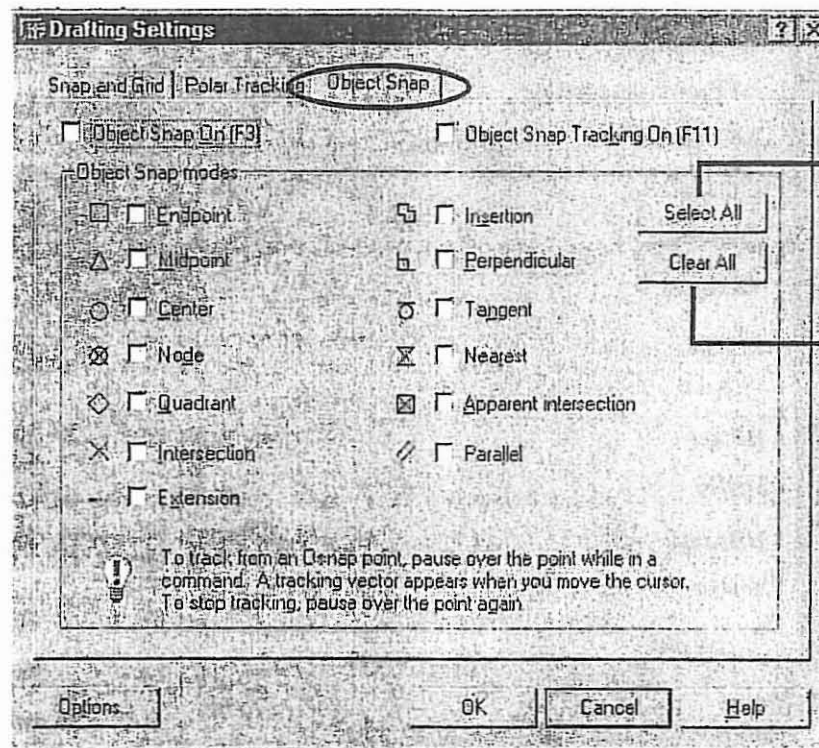
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## D: OBJECT SNAPS (TOOLS)

An object snap mode specifies a point at an exact location on an object. You can use an object snap once in the middle of a command, or you can set running object snaps. Running object snap modes can be toggled on and off with the Osnap button on the status bar or the function key F3. You can use the TAB key to cycle through available object snaps. Object snap settings are stored with the drawing.



Select All  
Turns on all  
object snap  
modes.

Clear All  
Turns off all  
object snap  
modes.

fig. IV-34. Showing Drafting Settings  
Object Snap dialog box

Select the running object snaps you want, then choose OK.

### Options for running Object Snap

- Tools Menu** : Drafting Settings (see fig. IV-34)
- Shortcut menu** : Press SHIFT while right-clicking in the drawing area and choose Osnap Settings. (see fig. IV-34a, next page)
- Command** : Osnap (or 'osnap for transparent use)
- Status bar** : Right click **OSNAP** on the status bar and choose Settings...

Running object snaps stay on until you turn them off. You can also turn on more than one running object snap at a time.

To use individual object snap at the prompt for a point, hold down the Shift Key and right click in the drawing area, then choose the object snap mode from the list. You can also enter/type the first three characters of the object snap. If you enter more than one name, separate the names with commas.

|                                                                                            |                                   |                                                                                    |                 |                                                            |                                                 |                                                                 |                                                                                                                                                 |                                                   |                |
|--------------------------------------------------------------------------------------------|-----------------------------------|------------------------------------------------------------------------------------|-----------------|------------------------------------------------------------|-------------------------------------------------|-----------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|----------------|
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## Object Snap toolbar



TracKing  
FROM  
ENDpoint  
MIDpoint  
INtersection  
APParent intersection  
EXTension  
CENter  
QUAdrant  
TANgent  
PERpendicular  
PARallel  
INSert  
NODe  
NEAreast  
NONe  
Object Snap

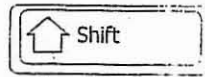


fig. IV-34a using SHIFT and Right Click  
(shortcut menu)

Temporary track point  
From  
Mid-Between 2-Points  
Point Filters

Endpoint  
Midpoint  
Intersection  
Apparent Intersect  
Extension

Center  
Quadrant  
Tangent

Perpendicular  
Parallel  
Node  
Insert  
Nearest  
None

Osnap Settings...

### ENDpoint

Snaps to the closest endpoint of an arc, elliptical arc, line, mline, polyline segment, or ray or to the closest corner of a trace, solid, or 3D face.

### MIDpoint

Snaps to the midpoint of an arc, ellipse, elliptical arc, line, mline, polyline segment, solid, spline, or xline.

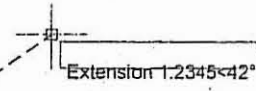
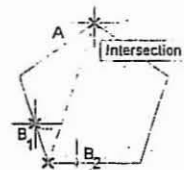
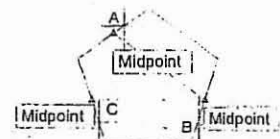
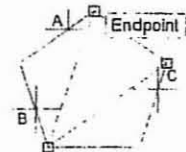
### INtersection

Snaps to the intersection of an arc, circle, ellipse, elliptical arc, line, mline, polyline, ray, spline, or xline.

You may get varying results if you have both  
Intersection and Apparent Intersection on at the same time.

### EXTension

Snaps to the extension point of an object. You can establish an extension path by moving the cursor over the endpoint of an object. A marker is placed on the endpoint. While the endpoint is marked, the cursor snaps to the extension path of the endpoint.



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**APParent Intersection**

Apparent Intersection snaps to the apparent intersection of two objects (arc, circle, ellipse, elliptical arc, line, mline, polyline, ray, spline, or xline) that do not intersect in 3D space but appear to intersect in the drawing display.

**CENter**

Snaps to the center of an arc, circle, ellipse, or elliptical arc.

**NODe**

Snaps to a point object.

**QUAdrant**

Snaps to a quadrant point of an arc, circle, ellipse, or elliptical arc.

**INSertion**

Snaps to the insertion point of an attribute, a block, a shape, or text.

**TANGent**

Snaps to the tangent of an arc, circle, ellipse, or elliptical arc.

**NEArest**

Snaps to the nearest point on an arc, circle, ellipse, elliptical arc, line, mline, point, polyline, spline, or xline.

**PERpendicular**

Snaps to a point perpendicular to an arc, circle, ellipse, elliptical arc, line, mline, polyline, ray, solid, spline, or xline.

**PARallel**

Snaps to an extension in parallel with an object. When you move the cursor over the endpoint of an object, the endpoint is marked and the cursor snaps to the parallel alignment path to that object. The alignment path is calculated from the current "from point" of the command.

**NOne**

Turns off object snap modes.

**M2P or MTP (Mid between two points)**

Locates the midpoint between two points  
(Use SHIFT & Right-click or type M2P)

**OBJECT SNAP TRACKING(OTRACK)**

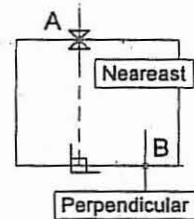
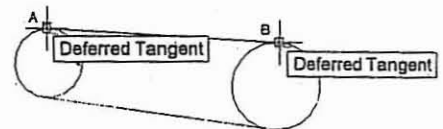
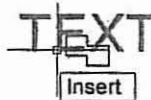
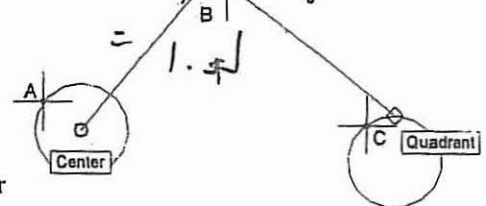
Use object snap tracking to track along alignment paths that are based on object snap points.

Com: C4

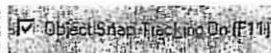
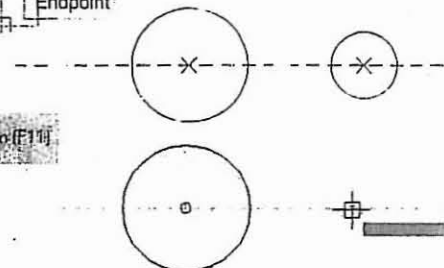
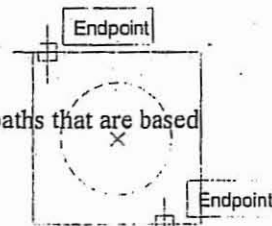
Op: mtp/m2p

Opt: pick pt. #

Opt: pick pt. #



TE - temporarily  
TRACKING

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## 5. ARC (continuation of curves from page 28)

Creates an Arc, default direction is counterclockwise.

*Some common methods for creating Arc*

Exer. # 7: 3point Arc (see fig.IV-35)



Command : A (enter)  
Specify start point of arc or [CEnter] : pick pt. 1  
Specify second point of arc or [CEnter/End] : pick pt. 2  
Specify end point of arc : pick pt. 3

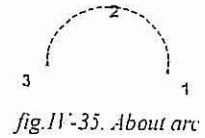


fig.IV-35. About arc

Exer. # 8: Continue Arc (see fig.IV-36)

Command : press enter  
Specify start point of arc or [CEnter] : press enter  
Specify end point of arc : pick any point

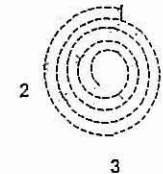


fig. IV-36. Using continued arc to create spiral

Exer. # 9: Start, Center, Endpoint (see fig.IV-37)

Command : select SCE (from DRAW pulldown menu)  
Specify start point of arc or [CEnter] : pick MID A  
Specify center point of arc : pick END B  
Specify end point of arc or [Angle/chord Length] : pick MID C

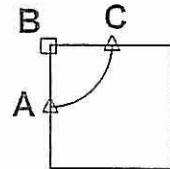


fig. IV-37. Using SCE

Exer. # 10: Start, Center, Angle (see fig.IV-38)

Command : select SCA (from DRAW pulldown menu)  
Specify start point of arc or [CEnter] : pick MID D  
Specify center point of arc : pick END E  
Specify included angle : 90

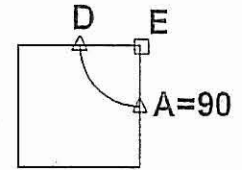


fig. IV-38. Using SCA  
5.00

Exer. # 11: Start, Center, Length (see fig.IV-39)

Command : select SCL (from DRAW pulldown menu)  
Specify start point of arc or [CEnter] : pick MID F  
Specify center point of arc : pick END G  
Specify length of chord : 'CAL  
Initializing...>> Expression : sqrt(12.5)  
3.53553

L=3.53553

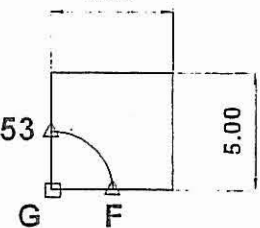


fig. IV-39. Using SCL

Exer. # 12: Start, End, Direction (Ortho On (F8) or Polar On (F10))  
(see fig.IV-40)

Command : select SED (from DRAW pulldown menu)  
Specify start point of arc or [CEnter] : pick MID H  
Specify end point of arc : pick END I  
Specify tangent direction for the start point of arc : pick J

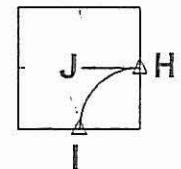


fig. IV-40 Using SED



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## DRAWING &amp; LABELLING A SIMPLE PLAN

## A: CREATING A STUDIO USING OFFSET, FILLET &amp; TRIM

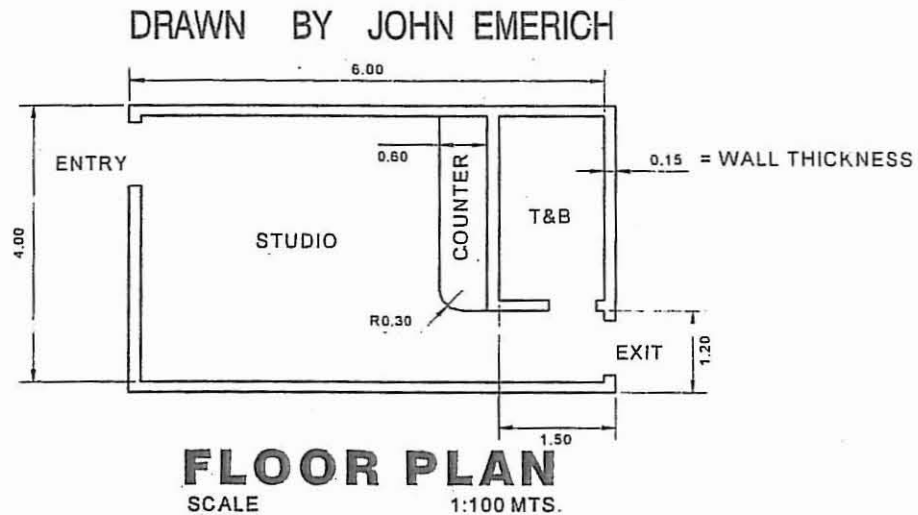


fig.V-1. Studio Floor Plan

## 1. OFFSET

Command to copy objects that are similar and parallel to existing entities at a specified distance or at a through point.

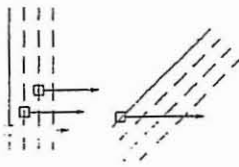


fig.V-2 offset using linears

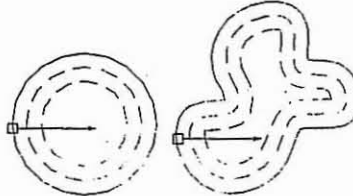


fig.V-3 offset using curves

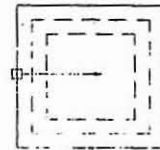


fig.V-4 offset using bounded plane



Command : **OFFSET** or **O** (enter)

Command: O OFFSET

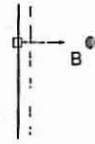
Current settings: Erase source=No Layer=Source OFFSETGAPTYPE=0

Specify offset distance or [Through/Erase/Layer] <1.0000>: **0.15**

Select object to offset or [Exit/Undo] <Exit>: **pick object A**

Specify point on side to offset or [Exit/Multiple/Undo] <Exit>: **pick pt. B**

Select object to offset or [Exit/Undo] <Exit>: **press Enter**



Try: **Erase and Multiple option (Acad 2006)**

AD

Cavite

1976



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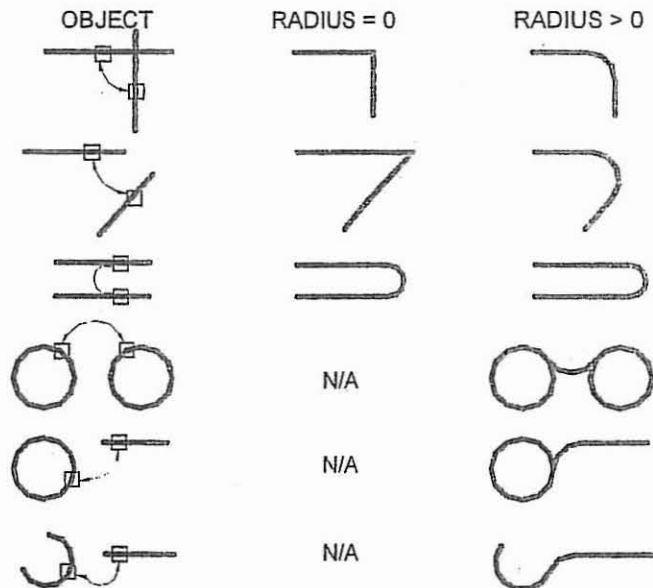
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## 2. FILLET

Command to round or fillet the edges of two selected objects.

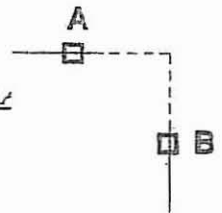


Command: **FILLET** or **F** (enter)

Current settings: Mode = TRIM, Radius = 0.0000

Select first object or [Undo/Polyline/Radius/Trim/Multiple]: pick object A

Select second object or shift-select to apply corner: pick object B



Try: **Multiple**

## 3. TRIM

Command to cut objects from a specified cutting edge(s)

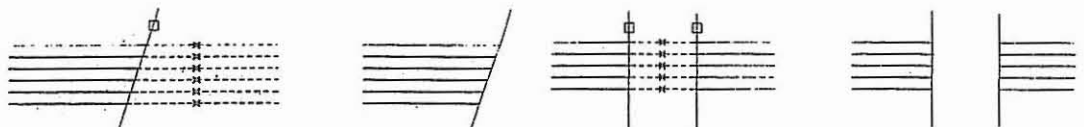


fig. V-5 Using trim



Command: **TRIM** or **TR**

Select objects or <select all>: (pick the object as cutting edge)

Select objects: (enter)

Select object to trim or shift-select to extend or

[Fence/Crossing/Project/Edge/eRase/Undo]: (pick the object to be cut)

Select object to trim or shift-select to extend or

[Fence/Crossing/Project/Edge/eRase/Undo]: (press enter)



WHERE:

- = cutting edges
- x = obj. to trim



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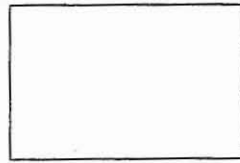
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Exer. # 1: Drafting the studio plan as shown

### EXTERIOR WALLS

1. LINE or RECTANG



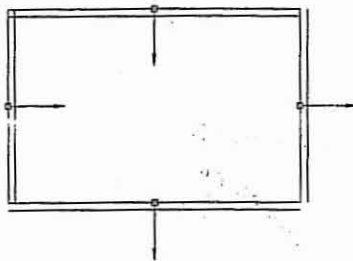
6.00 X 4.00

2. ZOOM for proper viewing

### WALL THICKNESS

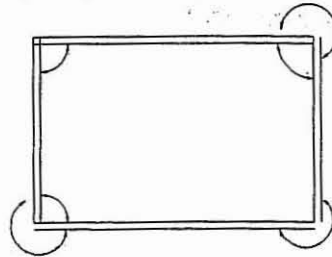
3. EXPLODE (if RECTANGLE)

4. OFFSET by 0.15

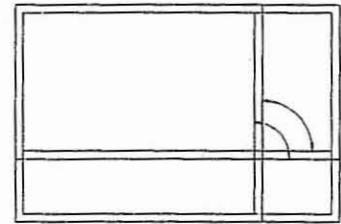


### FILLET THE EDGES

5. FILLET (radius = 0)

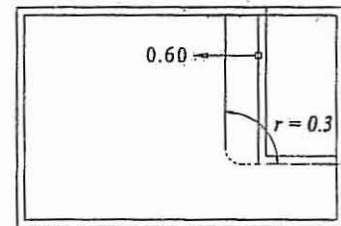


7. FILLET RADIUS = 0



8. OFFSET by 0.60 (counter)

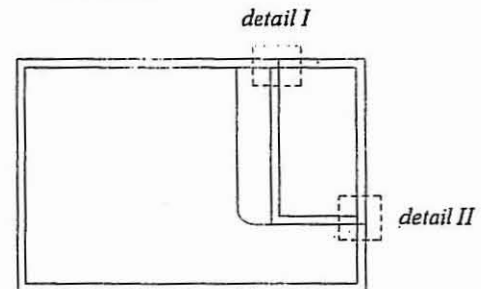
9. FILLET (radius = 0.30)



### CREATING A T-WALL

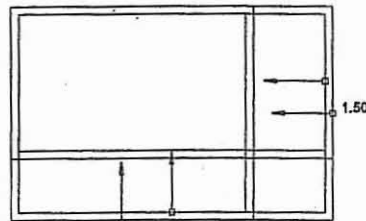
10. ZOOM (window)

11. TRIM



### TOILET PARTITION AND COUNTER

6. OFFSET by 1.5 and 1.2



1.20



detail I

detail II

### WHERE :



□ = cutting edges

x = obj. to trim



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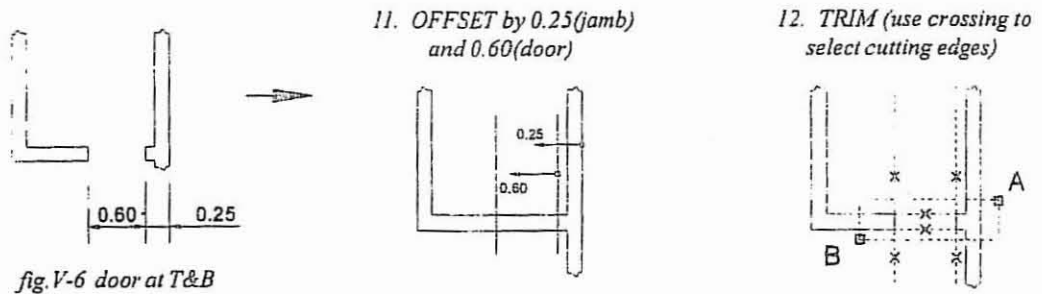
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## CREATING DOOR OPENING

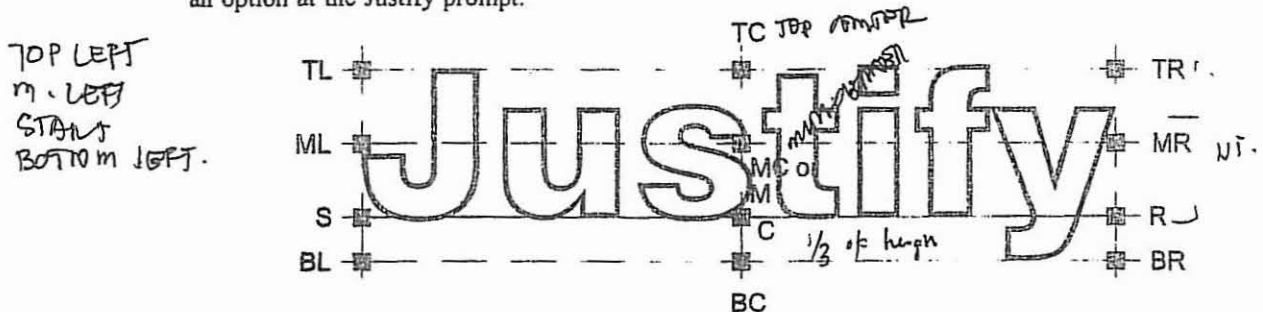


## CREATE OTHER DOOR OPENINGS

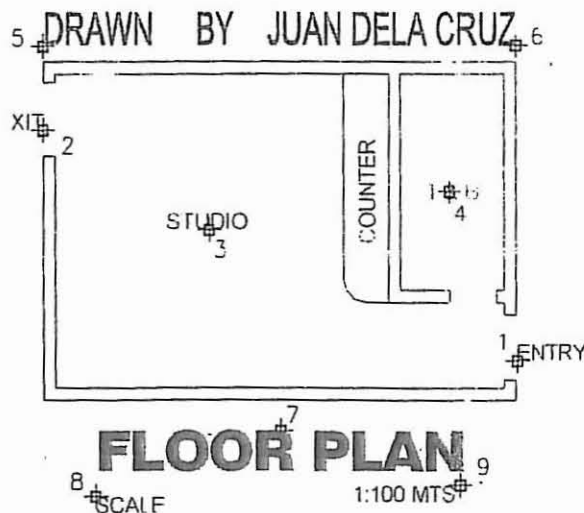
### B: LABELLING A PLAN USING TEXT (DTEXT / MTEXT)

#### 1. JUSTIFICATION OF TEXT

As you create text, you can align it horizontally. That is, you can justify it using one of the alignment options shown in the following illustration. Left alignment is the default. To left-align text, do not enter an option at the Justify prompt.



Exer. # 1: Label studio as shown:



WHERE :

|     |   |                |
|-----|---|----------------|
| 1   | = | Start          |
| 2   | = | Right          |
| 3   | = | Center         |
| 4   | = | Middle         |
| 5&6 | = | Fit (ortho on) |
| 7   | = | Top Center     |
| 8   | = | Top Left       |
| 9   | = | Top Right      |



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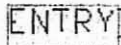
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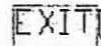
## 2. TEXT / DTEXT

Using TEXT or DTEXT you can create one or more lines of text and end each line when you press ENTER. Each text line is a separate object that you can relocate, reformat, or otherwise modify.

### a) START

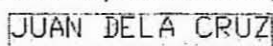
 Command : TEXT (enter)  
Specify start point of text or [Justify/Style] : pick pt. 1  
Specify height <0.2000> : press enter  
Specify rotation angle of text <0> : press enter  
(type the text, press enter twice)  


### b) RIGHT/CENTER/MIDDLE/TC/TL/TR

 Command : TEXT (enter)  
Specify start point of text or [Justify/Style] : J  
Enter an option [Align/Fit/Center/Middle/Right/TL/TC/TR/ML/MC/MR/BL/BC/BR] : R  
Specify right endpoint of text baseline : pick pt. 2  
Specify height <0.2000> : press enter  
Specify rotation angle of text <0> : press enter  
(type the text, press enter twice)  


### c) ALIGN / FIT

You can also fit line text between points that you specify. This option stretches or squeezes the text to fill the designated space.

 Command : TEXT (enter)  
Specify start point of text or [Justify/Style] : F  
Specify first endpoint of text baseline : pick pt. 5  
Specify second endpoint of text baseline : pick pt. 6  
Specify height <0.2000> : 0.30  
(type the text, press enter twice)  


## 3. MTEXT

MTEXT creates paragraphs that fit within a nonprinting text boundary. You create the text boundary to define the width of the paragraph. You can also specify the justification, style, height, rotation, width, color, spacing, and other text attributes using MTEXT

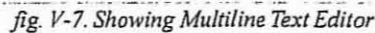
Exer. # 2: Use MTEXT to write the following lines

 Command : T (enter)  
Specify first corner : pick any pt.  
Specify opposite corner or [Height/Justify/Line spacing/Rotation/Style/Width] : pick any pt.

After you specify the point for the opposite corner, AutoCAD displays the Multiline Text Editor.

|                                                                                           |  |                                                                                    |  |                                                                                                                                                 |  |                                                                |  |
|-------------------------------------------------------------------------------------------|--|------------------------------------------------------------------------------------|--|-------------------------------------------------------------------------------------------------------------------------------------------------|--|----------------------------------------------------------------|--|
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- Choose OK.



|     |                                |             |
|-----|--------------------------------|-------------|
| %%% | - forces a single percent sign | ( % )       |
| %%p | - draws a plus/minus symbol    | ( ± )       |
| %%d | - draws a degree symbol        | ( ° )       |
| %%c | - draws a diameter symbol      | ( φ )       |
| %%u | - draws an underscore          | <u>ACAD</u> |
| %%o | - draws an overscore           | <u>Dona</u> |

[illegible]

*fig.V-8.Showing Shortcut Menu of the Multiline Text Editor*

### 5. OTHER SYMBOL(MTEXT only)

|                                     |                   |                  |                                     |
|-------------------------------------|-------------------|------------------|-------------------------------------|
|                                     |                   | Center Line      | 1/4-2104                            |
|                                     |                   | Dots             | 1/4-0214                            |
|                                     |                   | Electrical Phase | 1/4-0218                            |
|                                     |                   | Flow Line        | 1/4-1101                            |
|                                     |                   | Identity         | 1/4-2201                            |
|                                     |                   | Install Length   | 1/4-1203                            |
|                                     |                   | Monument Line    | 1/4-1102                            |
|                                     |                   | Hot Lead         | 1/4-2203                            |
|                                     |                   | Chin             | 1/4-2125                            |
|                                     |                   | Omega            | 1/4-0349                            |
|                                     |                   | Property Line    | 1/4-2144                            |
|                                     |                   | Subscript 2      | 1/4-2002                            |
|                                     |                   | Squiggles        | 1/4-0002                            |
|                                     |                   | Cubed            | 1/4-0003                            |
| Learn about HTEXT                   |                   |                  |                                     |
| <input checked="" type="checkbox"/> | Show Toolbar      |                  |                                     |
| <input checked="" type="checkbox"/> | Show Options      |                  |                                     |
| <input checked="" type="checkbox"/> | Show Ruler        |                  |                                     |
| <input checked="" type="checkbox"/> | Shaded Background |                  |                                     |
| Insert Field                        |                   | Ctrl+F           | Non-breaking Space Ctrl+Shift+Space |
| Insert Field                        |                   | Other            |                                     |

- 5.1 Right-click inside the multiline text editor
- 5.2 Click Symbol >> Other
- 5.3 Select the font name



- 5.4 Click the symbol.
- 5.5 Click **SELECT** button.
- 5.6 Click **COPY** button
- 5.7 Close the window.
- 5.8 Right-click in the text editor
- 5.9 Click *Paste*



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## AutoCAD

## 5. TEXT HEIGHT

use the following text height based on plotting scale.

|            |               |
|------------|---------------|
| if 1:100m  | 100cl = 0.25  |
| if 1:200m  | 100cl = 0.50  |
| if 1:50m   | 100cl = 0.125 |
| if 1:1000m | 100cl = 2.50  |

 Multiply 1000 on text height if units = mm

## 6. AUTOSTACK

Autostack stacks fractions as you type. In the Multiline Text Editor enter a fraction and the Autostack Properties dialog box is displayed.

Specify text to be stacked. Separate characters by a slash, pound sign, or carat.

|             |                           |
|-------------|---------------------------|
| Tolerance:  | 1^4 becomes $\frac{1}{4}$ |
| Horizontal: | 1/4 becomes $\frac{1}{4}$ |
| Diagonal:   | 1#4 becomes $\frac{1}{4}$ |

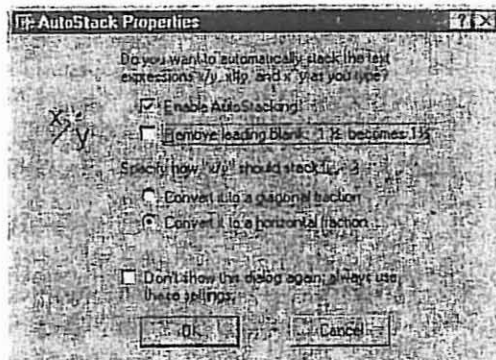
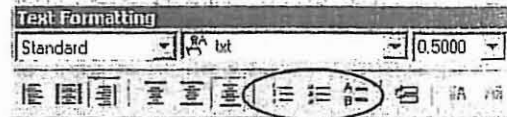


fig. V-9. Showing AutoStack Properties dialog box

| Font           | Style    |
|----------------|----------|
| romans - sty   | romans   |
| romans c - sty | romans c |
| swiss - sty    | swiss    |

## 7. BULLETS and NUMBERS



### STRUCTURAL STEEL NOTES:

1. ALL STRUCTURAL STEEL SHALL CONFORM TO THE 9TH EDITION OF THE ALLOWABLE STRESS DESIGN OF AISC.
2. UNLESS OTHERWISE NOTED, ALL MATERIALS SHALL BE IN ACCORDANCE WITH THE ASTM SPECIFICATIONS.
3. CONNECTIONS SHALL BE SHEAR TYPE CONNECTIONS.
4. MINIMUM BOLT DIAMETER SHALL BE 3/4" UNLESS OTHERWISE NOTED.

### - SPECIAL TEXT CHARACTERS

com: DT & (DTEXT)

120 > 7 12 % % D

24 < 7 24 % % C

± 64 > 7 % % P64

ACAD > 7 % % ACAD

### - AUTOSTACK (MTXT)

com: MTXT

HOR: > 12 1/2 > 7 12 L 1/2 L

DIA: > 1 1/2 > 7 12 L 1/2 L

TOLERANCE: > 12 1/2 > 7 12 L 1/2 L

### - BULLETS & NUMBERS

com: m & #

### - SYMBOLS (MTXT)

### - TEXT STYLE

common

A FONT FILE & ID

FURTHER MODIFYING

### - DIMENSIONS

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## C: EDITING TEXT/DTEXT/MTEXT

1. **SPELL** - command to check text spelling.
2. **DDEDIT** - command to edit text and attribute definitions
3. **MODIFY** - command to edit text location, height, angle, style, justification and value.
4. **FIND** - command to find, replace, select, or zoom to a specified text

### 1. SPELL

Corrects the spelling in text objects created with TEXT and MTEXT. The Check Spelling dialog box is displayed only if AutoCAD finds a dubious word in the specified text.

Exer. # 1: use SPELL to correct the spelling of "AUTOCAD"

Command : SP (enter)  
Select objects : pick AUTOCAD  
Select objects : press enter

AutoCAD displays the Check Spelling dialog box.

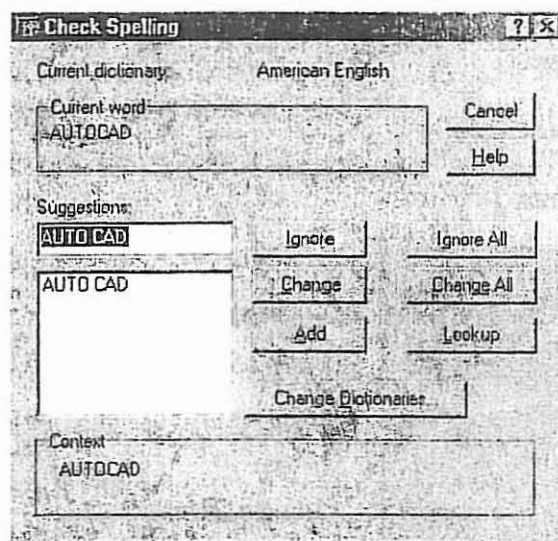


fig.V-10. Showing Check Spelling dialog box.

1. **Current Dictionary** - Displays the name of the current dictionary.
2. **Current Word** - Identifies a suspected misspelling.
3. **Suggestions** - Displays the word being checked and lists alternatives.
4. **Ignore** - Skips the current word.
5. **Ignore All** - Skips all remaining words that match the current word.
6. **Change** - Replaces the current word with the word in the Suggestions box.
7. **Change All** - Replaces the current word in all selected text objects.
8. **Add** - Adds the current word to the current custom dictionary. The maximum word length is 63 characters.
9. **Lookup** - Checks the spelling of the word in the Suggestions box.
10. **Change Dictionaries** - Displays the Change Dictionaries dialog box.
11. **Context** - Displays the phrase in which AutoCAD located the current word.

### 2. DDEDIT

Displays the Edit Text dialog box, in which you can edit only the text content.

Exer. # 2: use DDEDIT to change the phrase below

*AUTOCAD  
is the most  
popular CAD software  
in the world.*

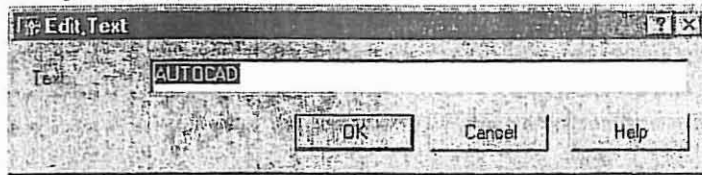
*AutoCAD  
is the best  
CAD software  
in the world.*

text before and after editing

|                                                                                            |                                                                                    |                                                            |                                                 |                                                                 |                                                                |                                                                                                                                                             |  |                |
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Command : ED (enter)  
Select objects : pick AUTOCAD



- In the Edit Text dialog box, enter the new text. Choose OK.
- Select another text object to edit, or press ENTER to exit the command.



Shortcut menu: Select the line text object to edit, right-click in the drawing area, and choose Text Edit or click twice the line text. You may also use CHANGE or CHPROP commands to edit most text properties.

### 3. PROPERTY ICON/ MODIFY

Controls properties of existing objects



When you enter PROPERTIES, AutoCAD displays the Properties window. While the Object Properties toolbar provides convenient access to the properties that are common to all objects, the Properties window is the main method you use to modify the complete set of object-specific properties, including properties that you have defined.

You can leave the Properties window open while you work. When you select an object, the properties window displays the properties of that object.

When multiple objects are selected, the Properties window displays the general properties and any other properties that are common among objects in the selection set.

Exer. # 3: Change the property of the following



Command : MO (enter)

- \* Pick DRAWN BY JUAN DELA CRUZ

Change the property value in a dialog box

Use the pickpoint button to change text height (0.30)

Place the pointer in the drawing area, Press esc (once)

- \* Pick FLOOR PLAN

Change the property value in a dialog box

Use the pickpoint button to change the color value (red)

Place the pointer in the drawing area, Press esc (once)

- \* Pick STUDIO

Change the property value in a dialog box

Use the pickpoint button to change the Obliquing angle

Press esc (once)

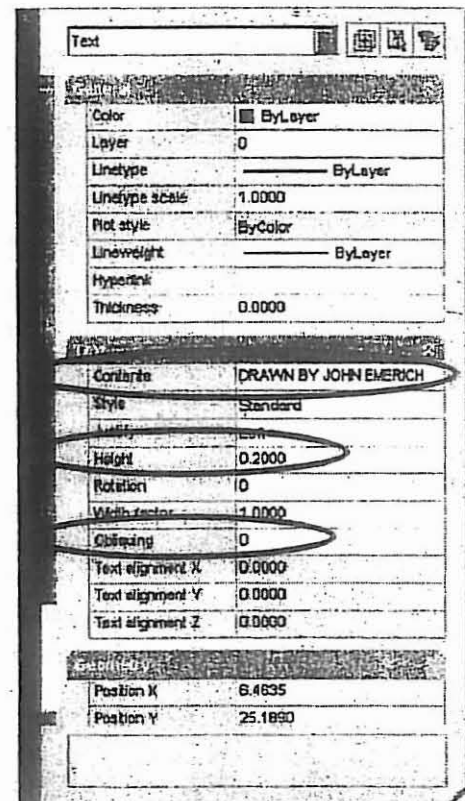


fig. V-11. Showing Properties dialog box



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**AutoCAD**

### 3.1 QUICK SELECT

Controls properties of existing objects

Exer. # 4: Change the property of the following using Quick Select:

To create a selection set using Quick Select

- 1 From the Properties dialog box, choose Quick Select.
- 2 In the Quick Select dialog box under Apply To, select Entire Drawing.
- 3 Under Object Type, select Text.
- 4 Under Properties, select Height.
- 5 Under Operator, select = Equals.
- 6 Under Value, enter 0.20
- 7 Under How to Apply, select Include in New Selection Set.
- 8 Choose OK.

AutoCAD selects all text in the drawing with the height of 0.20 and closes the Quick Select dialog box.

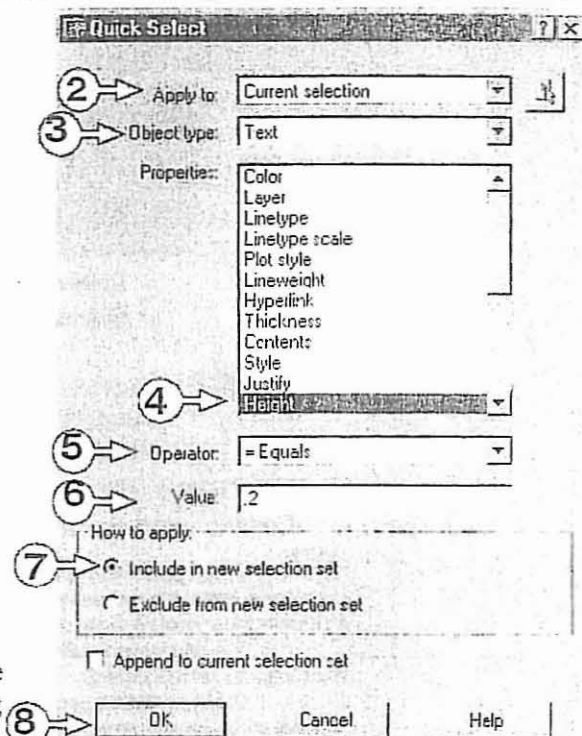


fig. V-12. Showing Quick Select dialog box

### 4. FIND

Find and Replace Text. FIND command searches for specified text and replaces it with alternative text.

Exer. # 5: Find the text WORLD and replace with PHILIPPINES

To find text:

Command : FIND (enter)

- 1 In Find Text String, enter the text you want to find.
- 3 In Search In, choose Entire Drawing to define the scope of your search.
- 4 Choose Find.

AutoCAD displays the found text with its surrounding context in the Context area.

- 5 To zoom to the found text in the drawing, choose Zoom To.

To replace text:

- 2 In Replace With, enter the text with which you want to replace the found text.
- 6 Choose Replace.
- 7 Choose Close.

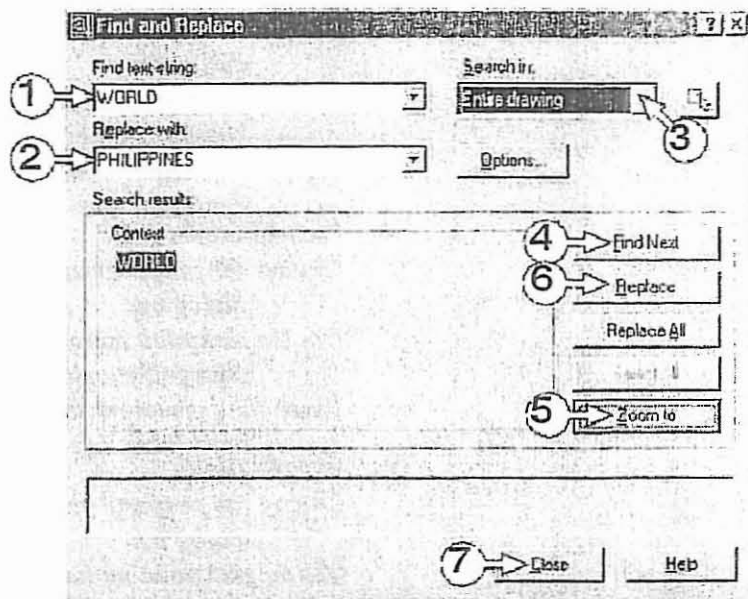


fig. V-13. Showing Find and Replace dialog box



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## D: TEXT STYLE AND FONT FILE

All text in an AutoCAD drawing has a text style associated with it. When you enter text, AutoCAD uses the current text style **STANDARD**, which sets the font, size, angle, orientation, and other text characteristics. You can create many text styles for use in your drawings. You can reuse the text styles you create by copying the text styles into other drawings using the AutoCAD Design Center.

### STYLE

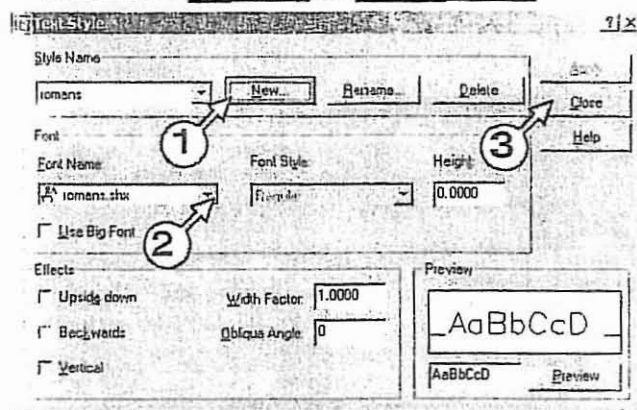
Command to load a font file and to further modify its appearances.

Exer. # 1: Create styles using the following font types/files

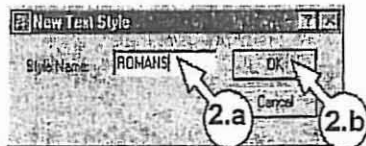
ROMANS.SHX - MICROCADD  
ROMANC.SHX - MICROCADD  
SWISS 721 BLK BT - MICROCADD

To assign a font to a text style

Command : **ST** (enter) or **STYLE** (enter)



- 1 In the Text Style dialog box, choose **NEW**
- 2 In the New Text Style dialog box, Enter a new name for the style Ex. **ROMANS**



- 3 Under **Font Name**, select the name of the font file you want to use. Ex. **Romans.shx**
- 4 Choose **OK** to close the new text style dialog box
- 5 Choose **Close**

## E: TABLE

A table is an object that contains data in rows and columns. When you create a table object, you first create an empty table, and then you add content to the cells in the table.

| DOOR SCHEDULE |       |        |             |
|---------------|-------|--------|-------------|
| Door No.      | Width | Height | No. of Sets |
| D1            | 1.00  | 2.10   | 1           |
| D2            | 0.80  | 2.10   | 5           |
| D3            | 0.60  | 2.10   | 6           |

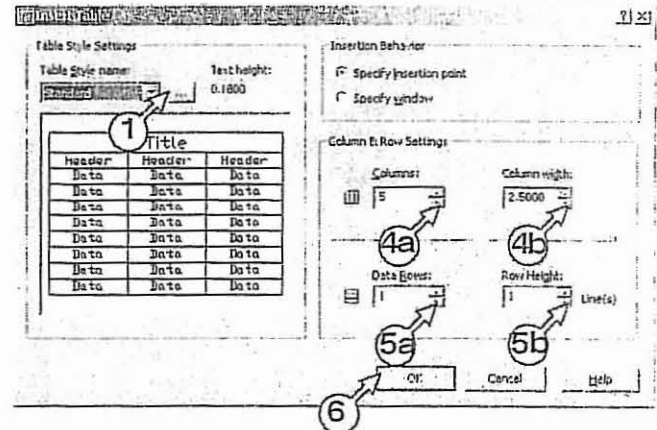
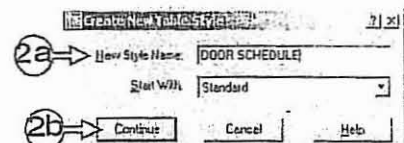


fig. V-14. Showing Insert Table dialog box

Exer. # 1: Create a Door Schedule

Command : **TABLE** (enter)

1. Click the [...] button to create a new table style.
2. Click **NEW** to create a table style



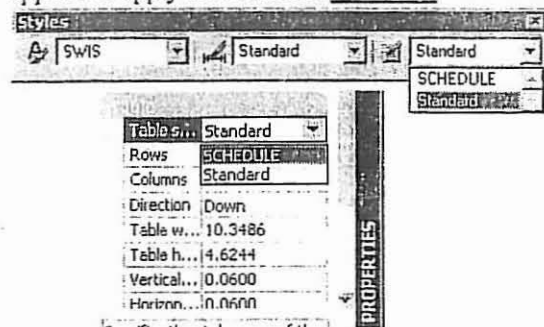
3. Choose **CLOSE** after creating a table style
4. Set the number of columns and the column width
5. Set the number of rows and the row height.
6. Click **OK**.



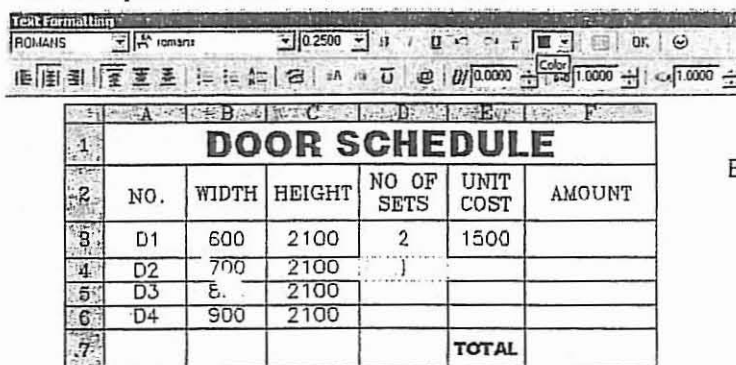
 You can copy table data from Microsoft Excel and paste it into your drawing as AutoCAD entities. AutoCAD 2005 automatically converts it to an AutoCAD table object while maintaining formatting from the original spreadsheet. You can modify the table and even add more rows and columns just as if you created it directly in AutoCAD software. (see special lesson)

E.1 To change the table style

- Select the table.
- From the toolbar (STYLES), select the style name to be applied or apply the command **MODIFY**



E.2 To input value in the cell, double-click the cell



E.3 To resize the column width or row height, click the cell to display grips, and stretch the grip

| DOOR SCHEDULE |       |        |            |              |        |
|---------------|-------|--------|------------|--------------|--------|
| NO.           | WIDTH | HEIGHT | NO OF SETS | UNIT COST    | AMOUNT |
| D1            | 600   | 2100   | 2          | 1500         |        |
| D2            | 700   | 2100   |            |              |        |
| D3            | 800   | 2100   |            |              |        |
| D4            | 900   | 2100   |            |              |        |
|               |       |        |            | <b>TOTAL</b> |        |

click the grip to stretch

E.4 To Apply an equation (i.e. MULTIPLICATION)

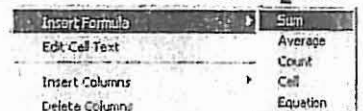
- Select a cell where the PRODUCT will be placed
- Right-click >> Insert Formula >> EQUATION
- Type the equation (ex. = D3\*E3)

\* where D2 & E2 are cell addresses

| DOOR SCHEDULE |       |        |            |              |        |
|---------------|-------|--------|------------|--------------|--------|
| NO.           | WIDTH | HEIGHT | NO OF SETS | UNIT COST    | AMOUNT |
| D1            | 600   | 2100   | 2          | 1500         | =D3*E3 |
| D2            | 700   | 2100   |            |              |        |
| D3            | 800   | 2100   |            |              |        |
| D4            | 900   | 2100   |            |              |        |
|               |       |        |            | <b>TOTAL</b> |        |

E.5 To Apply a Formula (i.e. SUM)

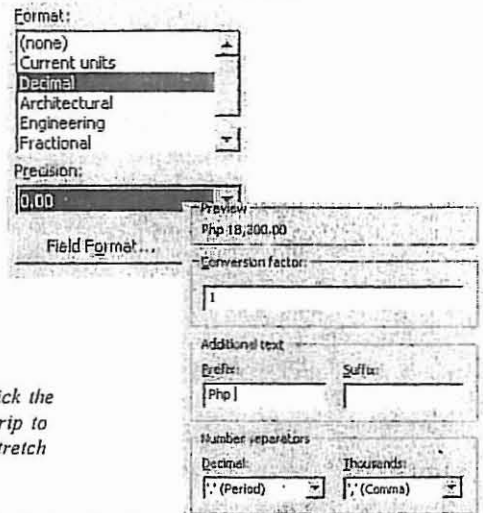
| DOOR SCHEDULE |       |        |            |              |        |
|---------------|-------|--------|------------|--------------|--------|
| NO.           | WIDTH | HEIGHT | NO OF SETS | UNIT COST    | AMOUNT |
| D1            | 600   | 2100   | 2          | 1500         | 3000   |
| D2            | 700   | 2100   | 3          | 1300         | 3900   |
| D3            | 800   | 2100   | 4          | 1950         | 7800   |
| D4            | 900   | 2100   | 2          | 1800         | 3600   |
|               |       |        |            | <b>TOTAL</b> |        |



- Click the cell.
- Right-click >> Choose SUM
- Select first corner of table cell range: pick A
- Select second corner of table cell range: pick B
- Click OK.

E.5 To FORMAT cell address

- Click the cell to format.
- Right-click >> Edit Field



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## E: FIELD (ACAD 2005)

A field is updatable text that is set up to display data that may change during the life cycle of the drawing. When the field is updated, the latest value of the field is displayed.

Exer. # 1: Using field to change the author name using drawing properties.

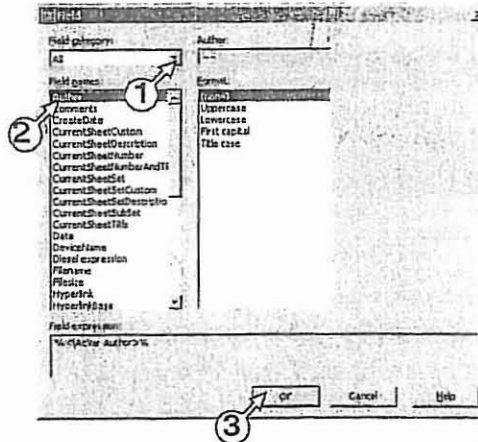


fig. V-18. Showing the Field dialog Box

Command : **FIELD** (enter)

1. In Field Category, Select **ALL**
2. In the Field Names, Select **AUTHOR**
3. Click **OK**
4. Specify start point or [Height/Justify]: **pick any point**

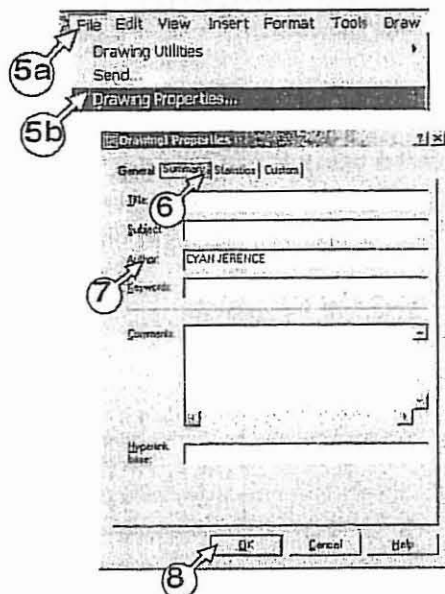
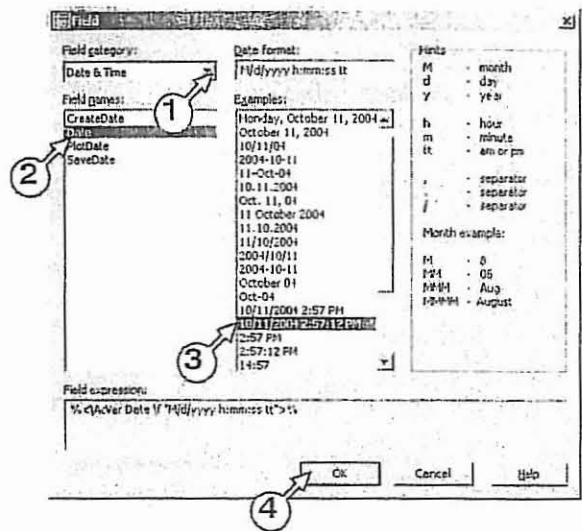


fig. V-19. Showing Drawing Properties Dialog Box

5. From File Pulldown Menu, Select **DRAWING PROPERTIES**
6. In the Drawing Properties Dialog Box, Select **SUMMARY** tab
7. In the Author, Type your name
8. Click **OK**
9. Then Regenerate the drawing.

Exer. # 2: Using field to add information such as date.



Command : **FIELD** (enter)

1. In Field Category, Select **DATE & TIME**
2. In the Field Names, Select **DATE**
3. In the Examples Pane, Select a Date Format
4. Click **OK**
5. Specify start point or [Height/Justify]: **pick any point**

Exer. # 3: Using field to update the Date & Time

Command : **UPDATEFIELD** (enter)

Select objects: **pick the field**

Select objects: **press enter**



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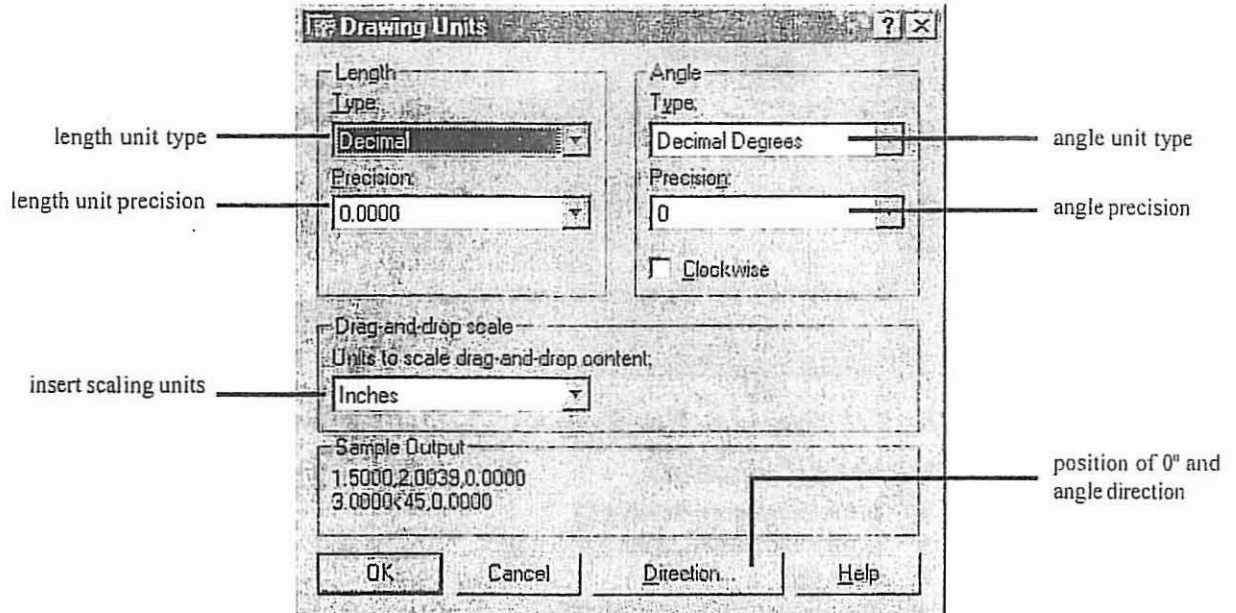
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## A: UNITS, LIMITS, PAPER SIZE

### 1. UNITS

Command to control unit of measurement for linears and angles and to set the number of decimal places.

Command : UN (enter) or DDUNITS



With the exception of Engineering and Architectural formats, these formats can be used with any basic unit of measurement. For example, Decimal mode is perfect for metric units as well as decimal English units.



Formula on computing paper size - Paper size x Plotting scale

### 2. ONSCREEN PAPER SIZE can be represented using the following:

- GRID EXTENTS - use LIMITS command to modify grid extents
- BOUNDING OBJECTS - paper can be represented by a rectangle, corner pts., lines, etc.

Exer. # 1: Limits for 10" x 8" paper at 1:100 scale

a) Convert inches to meter

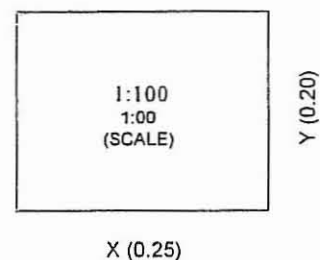
$$10" \times 0.0254 = 0.25\text{m.}$$

$$8" \times 0.0254 = 0.20\text{m.}$$

$$0.25 \times 100 = 25\text{m.}$$

$$0.20 \times 100 = 20\text{m.}$$

Onscreen paper size 25 x 20



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## b) LIMITS

Command : LIMITS (enter)Specify lower left corner or [ON/OFF] <0.0000,0.0000> : press enterSpecify upper right corner <12.0000,9.0000> : 25,20

You may also use a 25 x 20 Rectangle, then Zoom (Extents)

## c) ZOOM

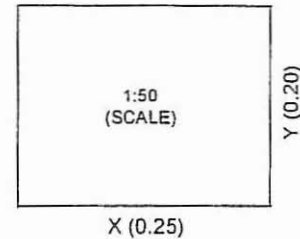
Command : Z (enter)[All/Center/Dynamic/Extents/Previous/Scale/Window] <real time> : A (enter)

Paper # 2: Same paper size at 1:50 scale

## a) Convert inches to meter

$$0.25 \times 50 = 12.5\text{m.}$$

$$0.20 \times 50 = 10\text{m.}$$

Onscreen paper size 12.5 x 10

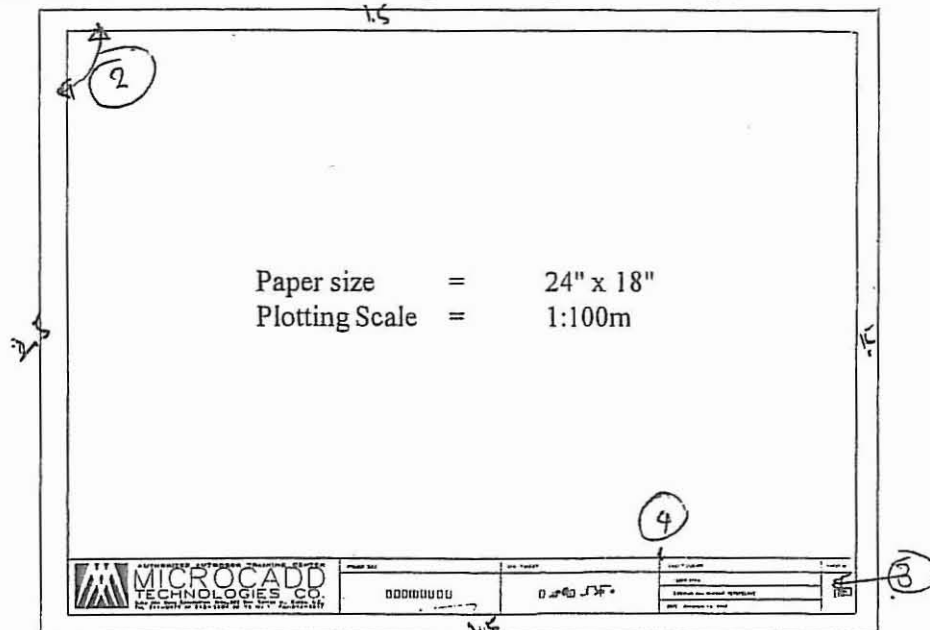
## b) RECTANG

Command : REC (enter)Specify first corner point or [Chamfer/Elevation/Fillet/Thickness/Width] : 0,0Specify other corner point or [Area/Dimensions/Rotation] : @12.5,10

## c) ZOOM

Command : Z (enter)[All/Center/Dynamic/Extents/Previous/Scale/Window] <real time> : E (enter)

Create a Titleblock as shown below (see enlarged drawing on the next page)



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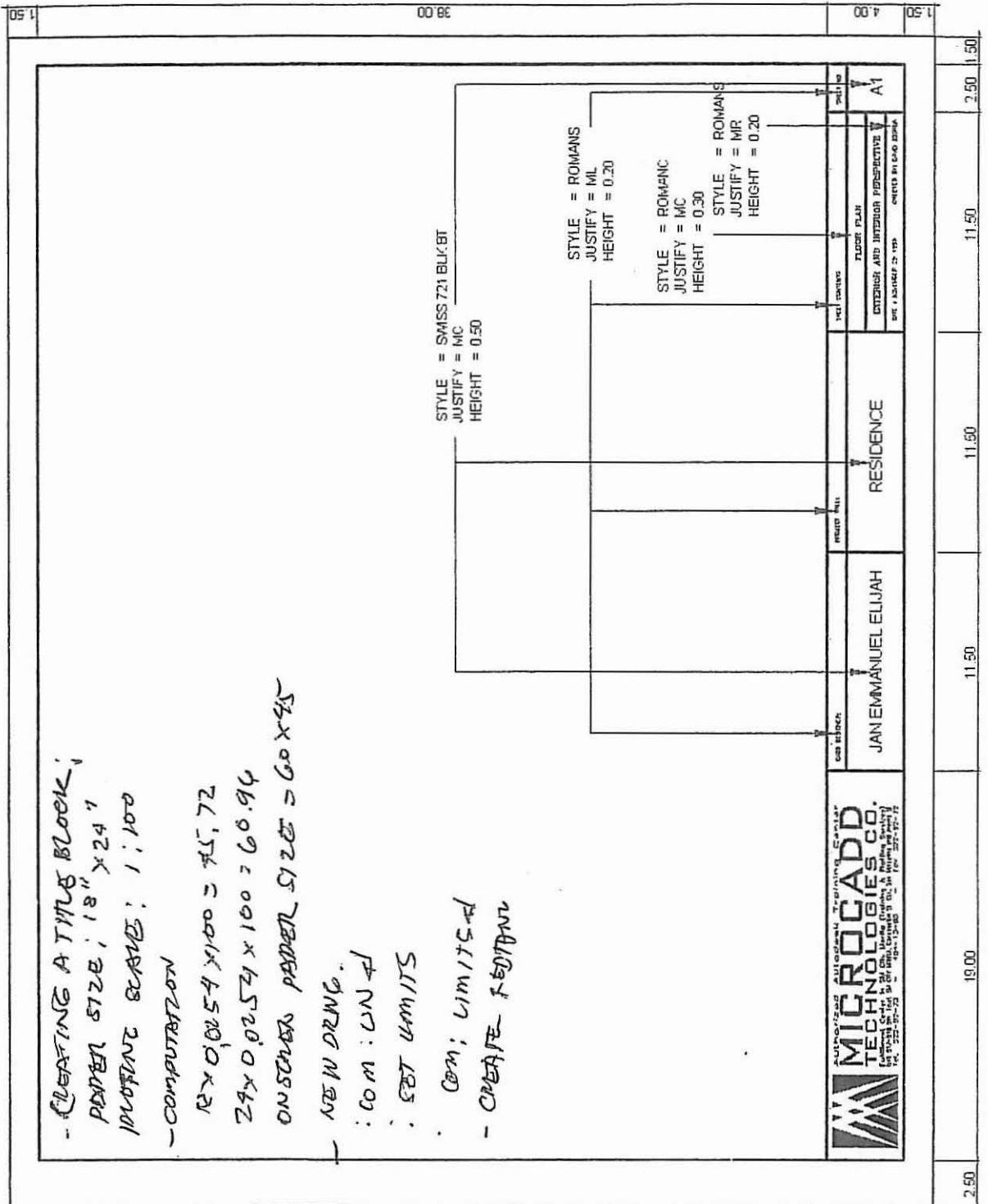
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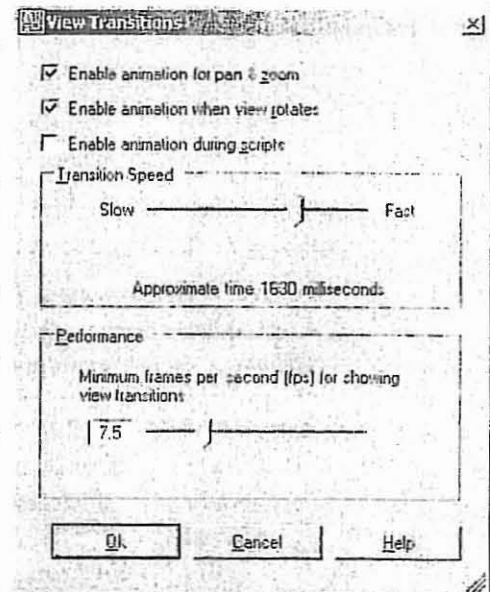
AutoCAD



## II: DISPLAY AND VIEW COMMANDS

### 1. ZOOM - command to modify drawing magnification.

- Real Time** - Zooms interactively to a logical extent. The cursor changes to a magnifying glass with plus (+) and minus (-) signs.
- All** - displays all objects & limits fit to screen
- Extents** - displays all objects fit to screen
- Center** - requires a center point & a magnification factor; the center point becomes the center of monitor and the magnification factor the height of screen.
- Previous** - restores last display
- Left** - left point becomes the lower left corner of monitor.
- Dynamic** - pannable zoom-window.
- Window** - windowed area is shown fit onscreen.
- Vmax** - allows user to zoom out as far as possible on the current vports virtual screen without forcing a complete regeneration of the drawing.
- Scale(x)** - numeric magnification factor relative to current view.
- Scale(xp)** - numeric magnification factor relative to paper space.
- Object** - display selected object & fit to screen.



### 2. VTOPTIONS - to control the animated behavior of Zoom & Pan

- 3. Pan** - Shifts drawing display without changing drawing magnification
- 4. Redraw** - removes blips.
- 5. Regen** - forces a complete drawing regeneration. It can be use after FILL=ON/OFF or TEXTFILL = 1/0 or QTEXT.
- 6. Regenauto** - command to control automatic regenerations.
- 7. Viewres** - control fast zoom mode and screen resolution of curves.
- 8. AV** - Aerial View
- 9. Character ( ' )** - to use a command transparently, enter an apostrophe (') before entering the command at any prompt.

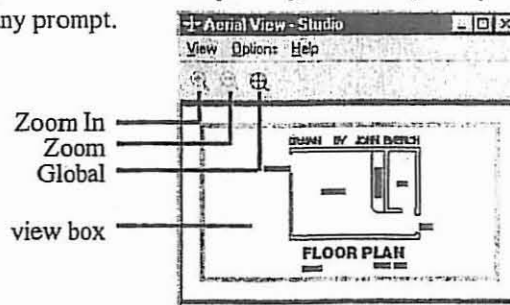


fig. VI-1. Showing AV

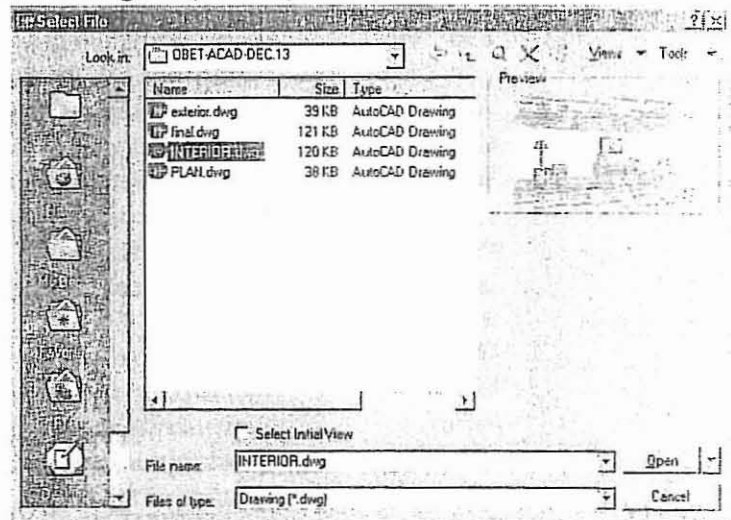
|                                                                                     |                                                                                            |  |                                                                                    |  |                                                            |                                                                                                                                                 |                                                                 |                |
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## C: UTILITIES AND FILES COMMANDS

### 1. Opening a drawing file

**NEW** - To begin a new drawing.

**OPEN** - To open an existing autocad drawing file (\*.DWG)



**MDE** - Opens multiple drawings simultaneously. (see page 89 for more details)

**Partial Drawings** - Load geometry from a selected view or layer into a drawing.

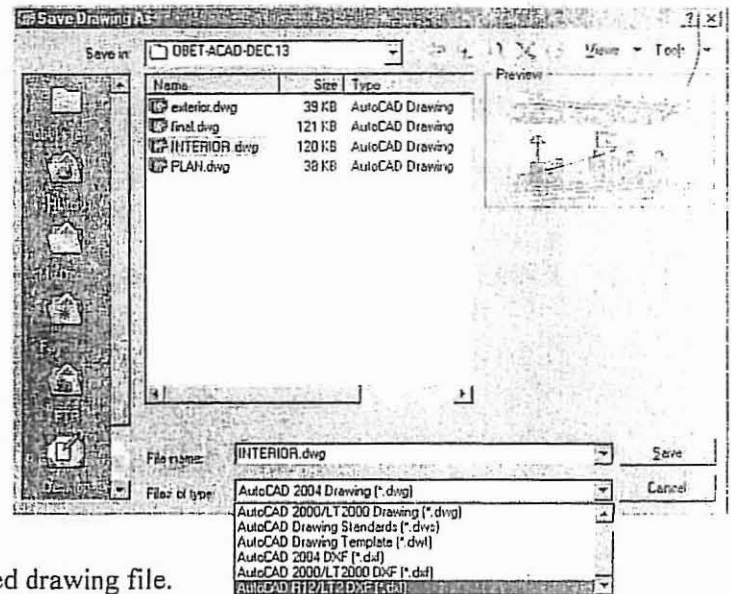
**QNEW** - Starts a new drawing with the option of using a default drawing template file.

### 2. Saving a drawing file

**Save** - To save current drawing file.

**Qsave** - Quick save

**Saveas** - To save current file to another file or filename or to export into other versions of autocad



### 3. Drawing Utilities

**Recover** - To recover a damaged drawing file.

**Purge** - To remove unused named objects and unused drawing parameters.



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## MODIFY AND CONSTRUCT COMMANDS



ERASE

COPY

MIRROR

OFFSET

ARRAY

MOVE

ROTATE

SCALE

STRETCH

TRIM

EXTEND

BREAK at Point

BREAK

JOIN

CHAMFER

FILLET

EXPLODE

### A. Commands to duplicate

ARRAY, COPY, OFFSET, & MIRROR

### B. Command to clean corners

FILLET & CHAMFER

### C. Command to modify object orientation

ROTATE, MOVE, & ALIGN

### D. Command to resize object

SCALE & STRETCH

### E. Command to edit polylines & splines

PEDIT, EXPLODE & SPLINEDIT

### F. Command to edit text

DDEDIT, DDMODIFY, CHANGE, & SPELL

### G. Command to edit attributes

ATTEDIT, DDATE, BATTMAN & EATTEXT

### H. Command to change position of endpoints

TRIM, EXTEND, LENGTHEN, GRIP, CHANGE & JOIN

### I. Command to mark/measure linears and curves

POINT, DIVIDE & MEASURE

### J. Use of grips

STRETCH, MOVE, ROTATE, COPY, SCALE, MIRROR

### K. Deleting & undeleting objects

ERASE, OOPS, UNDO, REDO, MREDO

## SELECTION METHOD (see appendix 167)

Command: Select (enter)

Select objects: ? (enter)

PICKBOX

Last

Previous

Window

Crossing

WPolygon

CPolygon

Fence

Remove

ALL

BOX

Group

Class

ADD

Multiple

Undo

AUTO

SINGLE



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## A: COMMANDS TO DUPLICATE

### 1. ARRAY

Command to duplicate objects/entities using Polar and Rectangular options

Exer. # 1: Using array with Polar option

(Creates an array by copying the selected objects around a center point.)

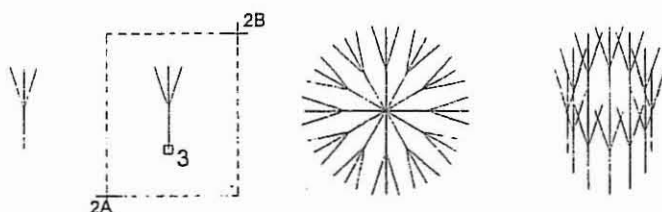
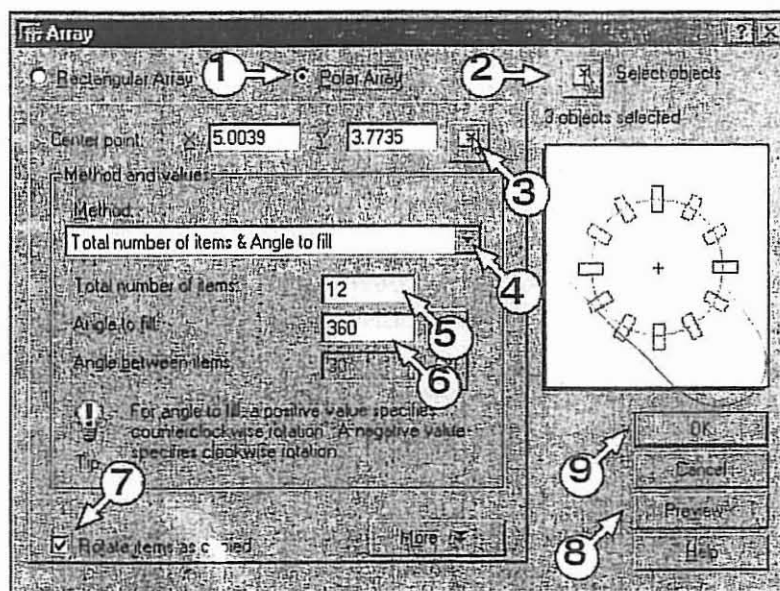


fig. VII-1. Using Polar Array



#### 1. Polar Array

#### 2. Select objects (2A & 2B)

#### 3. Center Point (3)

Specifies the center point of polar array. Enter coordinate values for X and Y, or choose Pick Center Point to use the pointing device to specify the location.

#### 4. Method

Sets the method used to position objects. This setting controls which of the Method and Value fields are available for specifying values.

#### 5. Total Number of Items

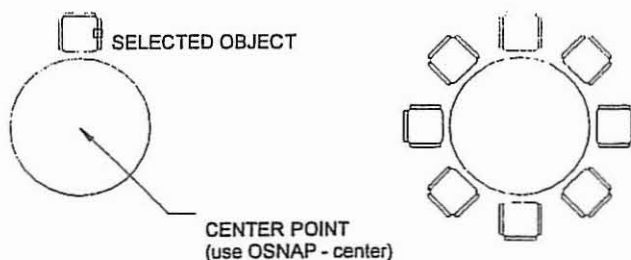
Sets the number of objects that appear in the resultant array. The default value is 4.

#### 6. Angle to Fill

Sets the size of the array by defining the included angle between the base points of the first and last elements in the array. A positive value specifies counterclockwise rotation. A negative value specifies clockwise rotation.

#### 7. Rotate Items as Copied

Rotates the items in the array, as shown in the preview area.



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## Exer. # 2: Using array with Rectangular option

(Creates an array defined by a number of rows and columns of copies of the selected object.)

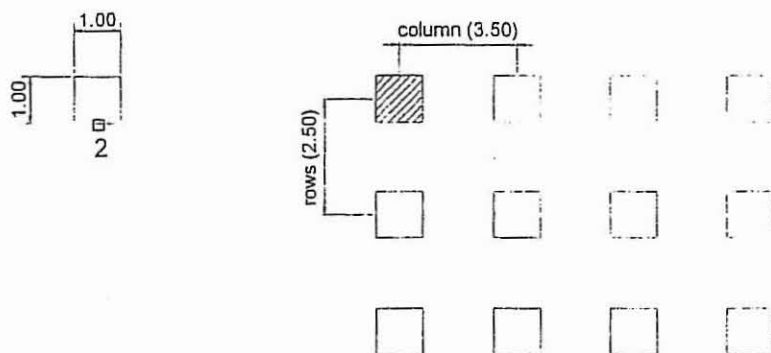
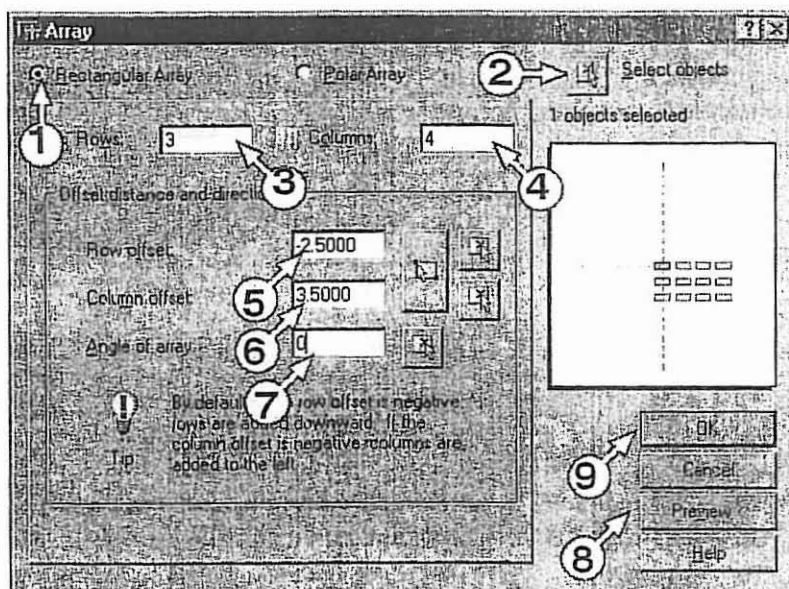


fig. VII-2. Using Rectangular Array



## 1. Rectangular Array

## 2. Select Objects

## 3. Rows

Specifies the number of rows in the array. If you specify one row, you must specify more than one column.

## 4. Columns

Specifies the number of columns in the array. If you specify one column, you must specify more than one row.

## 5. Offset Distance and Direction

Provides a space for you to specify the distance and direction of the array's offset.

## 6. Row Offset

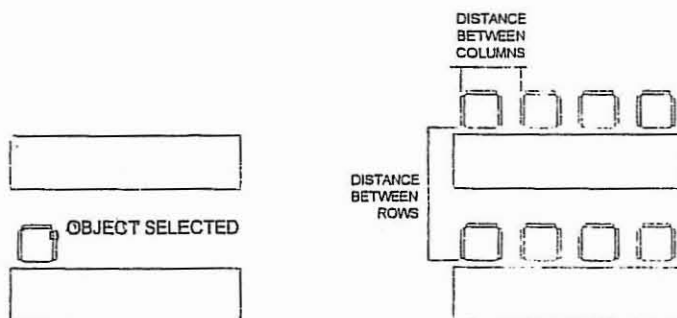
Specifies the distance (in units) between rows. To add rows downward, specify a negative value.

## 7. Column Offset

Specifies the distance (in units) between columns. To add columns to the left, specify a negative value.

## 8. Angle of Array

Specifies the angle of rotation. This angle is normally 0, so the rows and columns are orthogonal with respect to the X and Y drawing axes of the current UCS.



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**2. COPY**

Command to duplicate objects within a drawing, by defining a base point or displacement (starting point) and a second point of displacement.

Exer. # 3: Single copy with a given distance

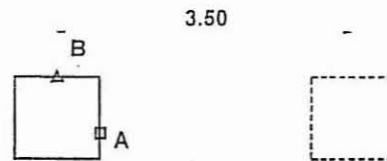


fig. 11-3. Showing copy with specified basepoint

Command : CO (enter)  
 Select objects : pick A  
 Select objects : press enter  
 Specify base point or [Displacement] <Displacement> : MID of (B) or pick any pt.  
 Specify second point or <use first point as displacement> : @3.5<0  
 Second point of displacement or <use first point as displacement> : ←

Exer. #4: Multiple copy

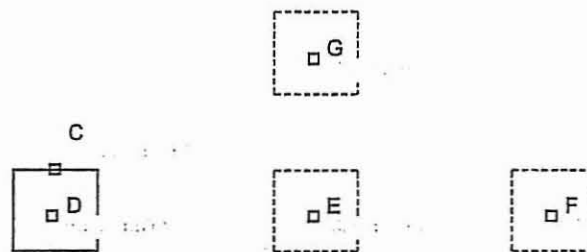


fig. 11-4. Using multiple copy

Command : CO (enter)  
 Select objects : pick C  
 Select objects : press enter  
 Specify base point or [Displacement] <Displacement> : pick any pt. (D)  
 Second point of displacement or <use first point as displacement> : pick E  
 Second point of displacement or <use first point as displacement> : pick F  
 Second point of displacement or <use first point as displacement> : pick G  
 Second point of displacement or <use first point as displacement> : ←

**3. OFFSET (see page 39)**

Command to copy objects that are similar and parallel to existing entities at a specified distance or through point.

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#### 4. MIRROR

Command to create a reverse image of selected objects.



**Mirrtext** - Controls how the MIRROR command reflects text.

- 0 - Retains text direction
- 1 - Reverses text direction

Exer. # 5: Mirror a floor plan as shown (set mirrtext)

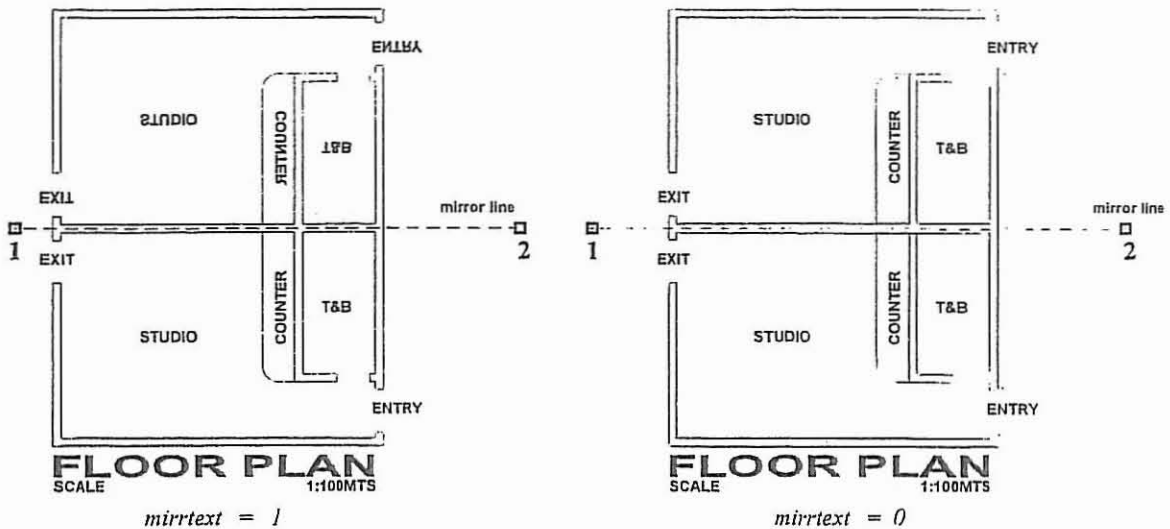


fig. VII-5. Using mirror and mirrtext



- Command : MI (enter)  
 Select objects : (select by window)  
 Select objects : press enter  
 Specify first point of mirror line : pick endpoint 1  
 Specify second point of mirror line : pick endpoint 2  
 Erase source objects? [Yes/No] <N> : press enter

### B: COMMAND TO CLEAN CORNERS

#### 1. FILLET (SEE PAGE 40)

Command to round or clean the edges of two selected objects.

#### 2. CHAMFER

Chamfering connects two nonparallel objects by extending or trimming them to intersect or to join with an optional beveled corner.



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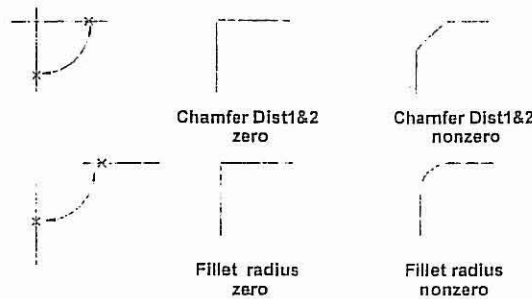


fig. VII-6. Showing diff. between chamfer and fillet

### Exercise 1: Chamfering



fig. VII-7. Showing result I



fig. VII-8. Showing result II


Command : CHA (enter)

(TRIM mode) Current chamfer Dist1 = 0.0000, Dist2 = 0.0000

Select first line or [Undo/Polyline/Distance/Angle/Trim/mEthod/Multiple] : D

Specify first chamfer distance <0.0000> : 0.30

Specify second chamfer distance <0.3000> : enter

Select first line or [Undo/Polyline/Distance/Angle/Trim/mEthod/Multiple] : pick A

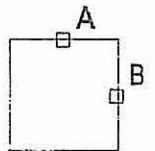
Select second line or shift-select to apply corner : pick B


fig. VII-9. Showing selected object



Hold down the shift key to set distance to zero


Command : press enter (see result II)

(TRIM mode) Current chamfer Dist1 = 0.3000, Dist2 = 0.3000

Select first line or [Undo/Polyline/Distance/Angle/Trim/mEthod/Multiple] : P

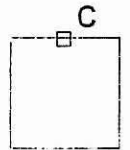
Select 2D polyline : pick C


fig. VII-10. Showing selected object

## C: COMMANDS TO MODIFY OBJECT ORIENTATION

### 1. ROTATE

Command to rotate selected objects at a specified base point

Exercise : Rotate object as shown


Command : RO (enter)

Select objects : pick C

Select objects : press enter

Specify base point : END of (D)

Specify rotation angle or [Copy/Reference] <0>: 45


fig. VII-11. About base point



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## 2. MOVE

Command to relocate selected objects

Exer. # 2: Move object as shown

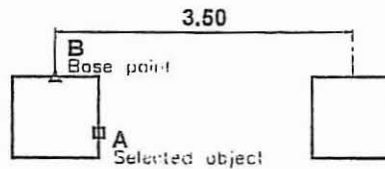


fig. VII-12. Showing move with specified basepoint



Command : M (enter)

Select objects : pick A

Select objects : (enter)

Specify base point or [Displacement] <Displacement>: MID of (B) or pick any point

Second point of displacement or <use first point as displacement>: @3.5<0 or (Ortho on) drag → , type 3.5 (enter)

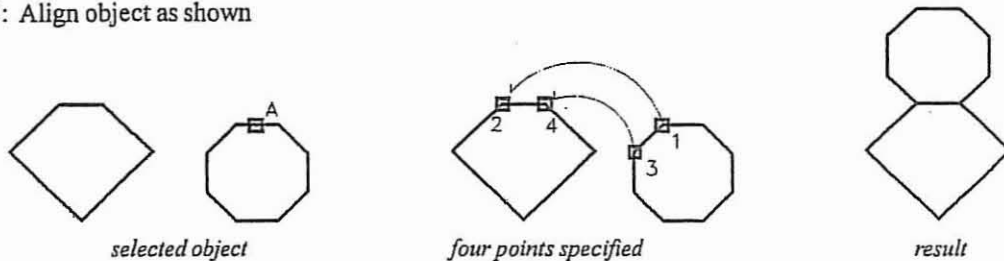
## 3. ALIGN

Aligns objects with other objects in 2D and 3D.



Use ALIGN to move, rotate, or scale objects into alignment with other objects. Add source points to the objects you want to align, and add destination points to the objects to which you want the source objects to align. You can add up to three pairs of source and destination points to align an object.

Exer. # 3: Align object as shown



Command : AL (enter)

Select objects : pick (A)

Select objects : press enter

Specify first source point : END of (1)

Specify first destination point : END of (2)

Specify second source point : END of (3)

Specify second destination point : END of (4)

Specify third source point or <continue> : press enter

Scale objects based on alignment points? [Yes/No] <N> : press enter



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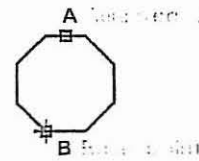
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## D: COMMANDS TO RESIZE OBJECT

### 1. SCALE

Command to shrink or enlarge selected objects

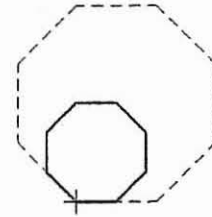
Exer. # 1: Scale a drawing using different Scale Factor



selected object



scale factor = 0.50



scale factor = 2.0



Command : SC (enter)  
 Select objects : pick A  
 Select objects : press enter  
 Specify base point : END of (A)  
 Specify scale factor or [Copy/Reference] <1.0000>: 2

### 2. STRETCH

Command to resize selected portion of objects by using crossing-window(C) or crossing-polygon(CP).

Exercise 1: Stretch as shown

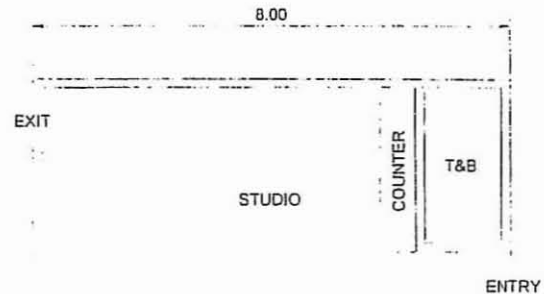
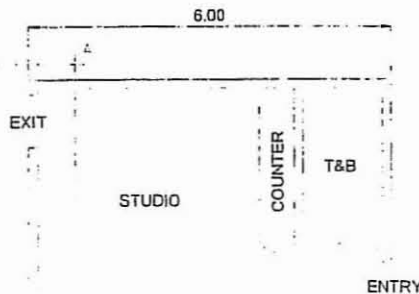


fig. VII-13 using stretch



Command : S (enter)  
 Select objects to stretch by crossing-window or crossing-polygon...  
 Select objects : pick pt. A  
 Specify opposite corner : pick pt. B  
 Select objects : press enter  
 Specify base point or [Displacement] <Displacement>: MID of (C) or pick any point  
 Specify second point or <use first point as displacement>: @2.00<180



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## E: COMMAND TO EDIT POLYLINES

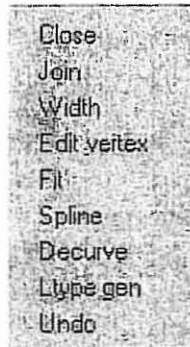
### 1. PEDIT

command to edit polylines.



When you select the Multiple option from the PEDIT command, you can select and edit more than one polyline object at a time, you can select both polyline and non-polyline objects. If one or more of the objects that you select are not polylines, you will be prompted to convert them to polylines.

#### Options :



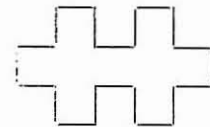
- connects the last segment with first. /removes closing segment
- connects lines, arc or pline to the end of an open pline
- specifies a new uniform width.
- moves, deletes or inserts vertex
- creates smooth curves passing every control point
- creates a curve passing through the first and the last control points.
- straightens all segments of the polyline.
- generates linetype in a continuous pattern through the vertices of the polyline

options using shortcut menu

Exer. # 1: Use pedit to modify appearance of a polyline



20 objects



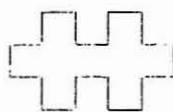
single obj. after using pedit

fig. VII-14. Using pedit



Command : PE (enter)  
 Select polyline or [Multiple]: : pick A  
 Object selected is not a polyline  
 Do you want to turn it into one? <Y> : press enter  
 Enter an option [Close/Join/Width/Edit vertex/Fit/Spline/Decurve/Ltypegen/Undo] : J  
 Select objects : pick pt. B  
 Specify opposite corner : pick pt. C  
 Select objects : press enter  
 19 segments added to polyline  
 Enter an option [Close/Join/Width/Edit vertex/Fit/Spline/Decurve/Ltype gen/Undo} : press enter

Exer. # 2: use pedit to modify appearance of a polyline



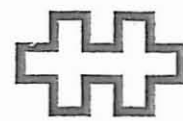
setting new width



using spline



using fit



using decurve



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## 2. EXPLODE

Breaks a compound object into its component objects.



Command : X (enter)  
 Select objects : pick an object  
 Select objects : press enter

### 2D and Lightweight Polyline

Discards any associated width or tangent information.



before EXPLODE after EXPLODE

## F: GRIPS SHORTCUT MENU

Using Grips - allows preselecting of entities before issuing a command (noun-verb sequence).

Exer. # 1: Use grip to modify the appearance of a polyline

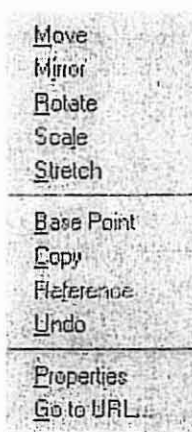


fig. VII-15. Shortcut menu showing grip modes

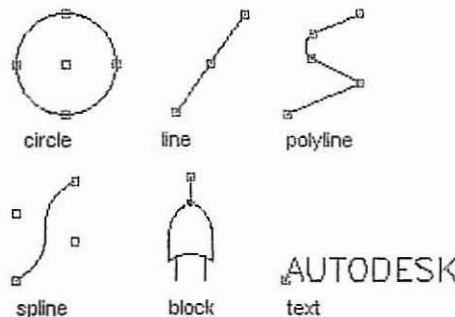
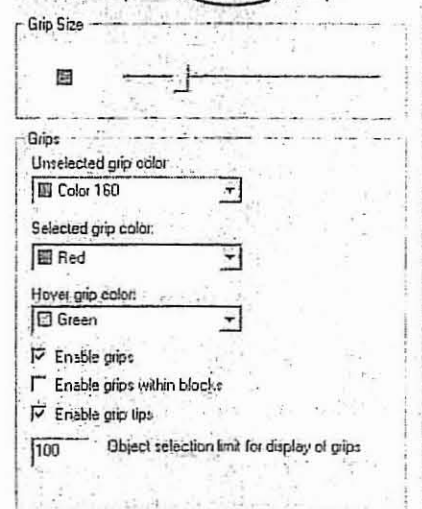


fig. VII-16. Showing examples of grip locations

To Resize the Grips

Command: OPTIONS

User Preferences | Display | Selection | Profiles |



Command : Select an object  
 Command : Select a grip to act as the base point  
 \*\* STRETCH \*\*  
 Specify stretch point or [Base point/Copy/Undo/eXit]

: Right click, then select one of the grip modes

## G: COMMAND TO CHANGE POSITION OF ENDPOINTS

### 1. TRIM (SEE PAGE 40)

Trims objects at a cutting edge defined by other objects

### 2. GRIP (SEE GRIPS ABOVE)

Command that allows you to make quick changes to objects in a drawing.



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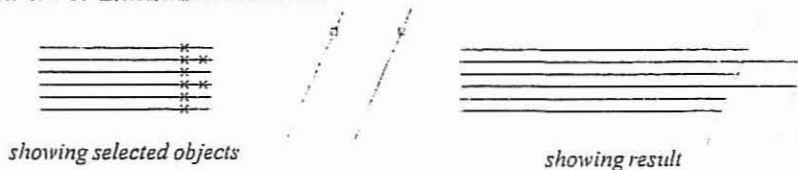
AutoCAD



### 3. EXTEND

Command to lengthen linears and curves up to a specified boundary.

Exer. # 1: Extend lines as shown



WHERE:

- = Boundary edges
- x = Obj. to extend

Command : EX (enter)  
Current settings: Projection=UCS, Edge=None  
Select boundary edges ...  
Select objects or <select all>: pick boundary edge(s) ( □ )  
Select objects : press enter  
Select object to extend or shift-select to trim or  
[Fence/Crossing/Project/Edge/Undo]: pick object to extend ( x )  
Select object to extend or shift-select to trim or  
[Fence/Crossing/Project/Edge/Undo]: (enter)



You can trim objects without leaving the EXTEND command. Hold down SHIFT and select the objects to be trimmed.

### 4. LENGTHEN

Command to lengthen/shorten some linears and curves.

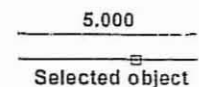
#### OPTIONS

- Select object. - Display length of selected object
- DElta - Specify length of object to be added
- Dynamic - Lengthen/shorten object by dynamic dragging
- Total - Set new total length of object

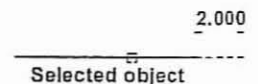
Exer. # 1: Lengthen or shorten object using above options



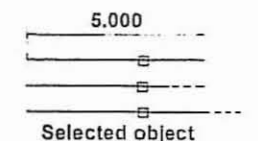
Command : LEN (enter)  
Select an object or [DElta/Percent/Total/DYnamic] : pick a line  
Current length: 5.000  
Select an object or [DElta/Percent/Total/DYnamic] : press enter



Command : LEN (enter)  
Select an object or [DElta/Percent/Total/DYnamic] : DE  
Enter delta length or [Angle] <0.0000> : 2  
Select an object to change or [Undo] : pick any line  
Select an object to change or [Undo] : press enter



Command : LEN (enter)  
Select an object or [DElta/Percent/Total/DYnamic] : T  
Specify total length or [Angle] <1.0000> : 5  
Select an object to change or [Undo] : pick any line  
Select an object to change or [Undo] : press enter



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## 5. CHANGE POINT

Command to lengthen or shorten lines by a "change point"

Exer.# 1: Lengthen or Shorten objects<Ortho F8=ON/OFF>

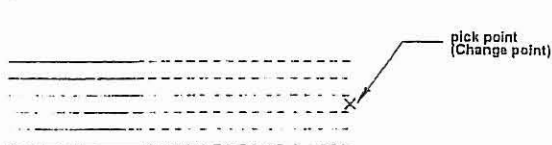


fig. VII-18. Using change  
F8=ON

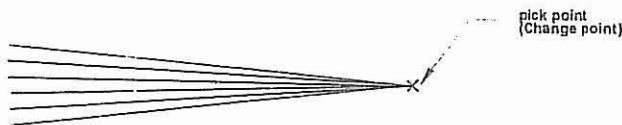


fig. VII-19. Using change  
F8=OFF

Command : CHANGE (enter)  
Select objects : pick all lines  
Select objects : press enter  
Specify change point or [Properties] : pick new location

## 6. BREAK

Command to break objects except hatch, solids, blocks, and texts/shapes.

Exer. # 1: Break the lines using different break options

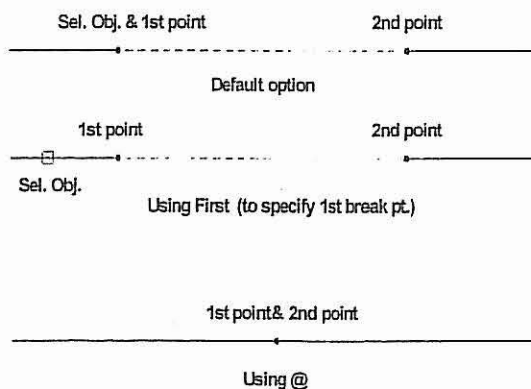


fig. VII-20. Using break command



Command : BR (enter)  
Select object : pick 1st point  
Specify second break point or [First point] : pick 2nd point

## 7. JOIN

Command to join objects to form a single, unbroken object.

fig. VII-21. Lines before Join  
(broken lines)

fig. VII-21. After Join  
(single line)



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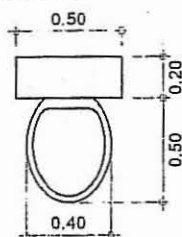
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## 1. WATER CLOSET



## STEP #1 (RECTANG)

Command : **REC** ↵  
 1<sup>st</sup> corner pt [C/E/F/T/W] : **pick pt. (A)**  
 Other cor. pt. [A/D/R] : **@0.50,0.20**

Command : **ZOOM** ↵  
 Options <real time> : **pick (B)**  
 Opposite corner : **pick (C)**

## STEP #2 (ELLIPSE)

Command : **EL** ↵  
 Axis endpoint [A/C] : **Mid of (D)**  
 Other endpt. of axis : **@0.55<270** ↵  
 Dist. to other axis [R] : **0.20** ↵

## STEP #3 (MOVE)

Command : **M** ↵  
 Select objects : **pick (E)**  
 Select objects : **enter**  
 Base pt. or disp. : **pick (E)** (or any pt.)  
 2<sup>nd</sup> pt. of disp. : **@0.05<90** ↵

## STEP #4 (TRIM)

Command : **TR** ↵  
 Select objects or <select all> : **pick (F)**  
 Select objects : **enter**  
 Select obj. to trim or [F/C/P/E/R/U] : **pick (G)**  
 Select obj. to trim or [F/C/P/E/R/U] : **enter**

## STEP #5 (OFFSET)

Command : **O** ↵  
 Specify offset dist. [T/E/L] : **0.03** ↵  
 Select object to offset [E/U] : **pick (H)**  
 Sp. pt. on side to offset [E/M/U] : **pick (I)**  
 Select object to offset [E/U] : **enter**

## STEP #6 (EXPLODE)

Command : **X** ↵  
 Select objects : **pick (J)**  
 Select objects : **enter**

## STEP #7 (OFFSET)

Command : **O** ↵  
 Offset dist. or [T/E/L] : **0.05** ↵  
 Sel. obj. to offset [E/U] : **pick (L)**  
 Pt. on side to offset [E/M/U] : **pick (M)**  
 Sel. to offset [E/U] : **enter**

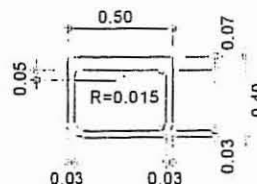
## STEP #8 (FILLET (radius = 0.05))

Command : **F** ↵  
 Select 1<sup>st</sup> object [U/P/R/T/M] : **R** ↵  
 Fillet radius <0.0300> : **0.05** ↵  
 Sel. 1<sup>st</sup> object [U/P/R/T/M] : **M** ↵  
 Sel. 1<sup>st</sup> object [U/P/R/T/M] : **pick (N)**  
 Sel. 2<sup>nd</sup> object or shift-select to apply corner : **pick (O)**  
 Sel. 1<sup>st</sup> object [U/P/R/T/M] : **pick (N1)**  
 Sel. 2<sup>nd</sup> object or shift-select to apply corner : **pick (O1)**

## STEP #9 (ZOOM extents then QSAVE)

(Filename: 2d-Template)

## 2. LAVATORY



## STEP #1 (RECTANG)

Command : **REC** ↵  
 1<sup>st</sup> corner pt [C/E/F/T/W] : **pick (A)**  
 Other cor. pt. [A/D/R] : **@0.50,0.40** ↵

Command : **ZOOM** ↵  
 Options <real time> : **pick (B)**  
 Opposite corner : **pick (C)**

## STEP #2 (OFFSET)

Command : **O** ↵  
 Offset dist. or [T/E/L] : **0.03** ↵  
 Select obj. to offset [E/U] : **pick (D)**  
 Pt. on side to offset [E/M/U] : **pick (E)**  
 Select obj. to offset [E/U] : **enter**

## STEP #3 (STRETCH)

Command : **S** ↵  
 Select objects : **C** ↵  
 First corner : **pick (F)**  
 Other corner : **pick (G)**  
 Select objects : **enter**  
 Base pt. or disp. : **Mid of (H)** (or any pt.)  
 2<sup>nd</sup> pt. of disp. : **@0.04<270** ↵

## STEP #4 (FILLET (radius = 0.03))

Command : **F** ↵  
 Select first object or [U/P/R/T/M] : **R** ↵  
 Specify fillet radius <0.00> : **0.03** ↵  
 Select first object or [U/P/R/T/M] : **P** ↵  
 Select 2D polyline : **pick (I)**



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SM Manila  
 5th Level  
 ☎ 484-1365 • 522-9272

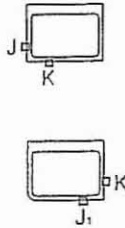
SM Centerpoint, Sta. Mesa  
 3rd Level  
 ☎ 714-3713 • 714-3738

SM Pampanga  
 Ground Fl., Main Bldg  
 ☎ 714-3713 • 714-3738

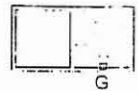
SM Bacoor Cavite  
 Ground Fl.  
 ☎ (046) 9701976

**STEP #5 (FILLET (radius = 0.06))**

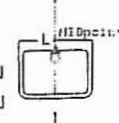
Command : **F** ↵  
 Select 1st object [U/P/R/T/M] : **R** ↵  
 Fillet radius <0.0300> : **0.06** ↵  
 Select 1st object [U/P/R/T/M] : **M** ↵  
 Select 1st object [U/P/R/T/M] : **pick J** ↵  
 Select 2nd object : **pick (K)** ↵  
 Select 1st object [U/P/R/T/M] : **pick (J1)** ↵  
 Select 2nd object : **pick (K1)** ↵  
 Select 1st object [U/P/R/T/M] : **(enter)** ↵

**STEP #4 (OFFSET or ARRAY and CAL)**

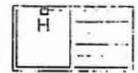
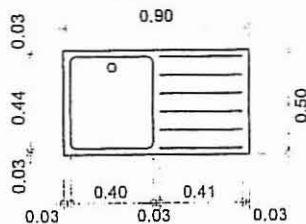
Command : **-AR** ↵  
 Select objects : **pick (G)** ↵  
 Select objects : **enter** ↵  
 Enter the type of array [R/P] <> : **R** ↵  
 Number of rows (- - -) <1> : **6** ↵  
 Number of columns (| | |) <1> : **enter** ↵  
 Dist. bet. rows or specify unit cell (- - -) : **cal** ↵  
 >> Expression: **0.44/5** ↵  
 0.088

**STEP #6 (CIRCLE and TEMPORARY TRACKING)**

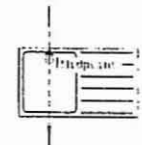
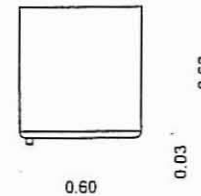
Command : **C** ↵  
 Cen. pt. for circle [3P/2P/Ttr] : **T T** ↵  
 Temporary OTRACK point : **Mid of (L)** ↵  
 Cen. pt. for circle [3P/2P/Ttr] : **0.05** ↵  
 Radius of circle [Diameter] <> : **0.015** ↵

**STEP #5 (FILLET (radius = 0.03))**

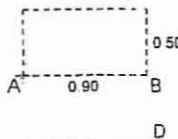
Command : **F** ↵  
 Sel. 1st object or [U/P/R/T/M] : **R** ↵  
 Specify fillet radius <0.0600> : **0.03** ↵  
 Sel. 1st object or [U/P/R/T/M] : **P** ↵  
 Select 2D pline : **pick (H)** ↵

**STEP #7 (ZOOM extents then QSAVE)****3. KITCHEN SINK****STEP #6 (CIRCLE and TEMPORARY TRACKING)**

Command : **C** ↵  
 Cen. pt. for circle [] : **T T** ↵  
 Temporary OTRACK pt. : **Mid of (I)** ↵  
 Cen. pt. for circle [] : **0.05** ↵  
 Radius [Diameter] <> : **0.02** ↵

**STEP #7 (ZOOM extents then QSAVE)****1. REFRIGERATOR****STEP #1 (RECTANG)**

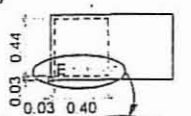
Command : **REC** ↵  
 1st cor. pt. [C/E/F/T/W] : **pick pt. (A)** ↵  
 Other cor. pt. [A/D/R] : **D** ↵  
 Length for rectangles <> : **0.90** ↵  
 Width for rectangles <> : **0.50** ↵  
 Other cor. pt. [A/D/R] : **pick pt. (B)** ↵

**Command : ZOOM**

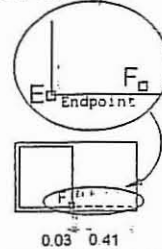
Options <real time> : **pick (C)** ↵  
 Opposite corner : **pick (D)** ↵

**STEP #2 (RECTANG and OSNAP FROM)**

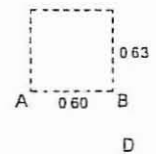
Command : **REC** ↵  
 1st corner pt [C/E/F/T/W] : **From** ↵  
 Base point : **End of (E)** ↵  
 <Offset> : **@0.03,0.03** ↵  
 Other cor. pt. [A/D/R] : **@0.40,0.44** ↵

**STEP #3 (LINE and OSNAP FROM)**

Command : **L** ↵  
 Specify first point : **From** ↵  
 Base point : **End of (F)** ↵  
 <Offset> : **@0.03<0** ↵  
 Next point or [Undo]: **@0.41<0** ↵  
 Next point or [Undo]: **enter** ↵

**STEP #1 (RECTANG)**

Command : **REC** ↵  
 1st cor. pt. [C/E/F/T/W] : **pick pt. (A)** ↵  
 Other cor. pt. [A/D/R] : **D** ↵  
 Length for rectangles <> : **0.60** ↵  
 Width for rectangles <> : **0.63** ↵  
 Other cor. pt. [A/D/R] : **pick pt. (B)** ↵

**Command : ZOOM**

Options <real time> : **pick (C)** ↵  
 Opposite corner : **pick (D)** ↵

**STEP #2 (EXPLODE)**

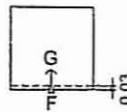
Command : **X** ↵  
 Select objects : **pick (E)** ↵  
 Select objects : **enter** ↵

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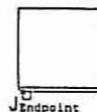
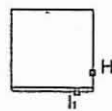
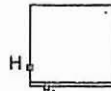
## STEP #3 (OFFSET)

Command : **O** ↵  
 Offset dist. or [T/E/L] : **0.03** ↵  
 Select obj. to offset [E/U] : **pick (F)** ↵  
 Point on side to offset [E/M/U] : **pick (G)** ↵  
 Select obj. to offset [E/U] <exit> : **enter** ↵



## STEP #4 (FILLET (radius = 0.03))

Command : **F** ↵  
 Select 1st object [U/P/R/T/M] : **R** ↵  
 Specify fillet radius <0.0300> : **enter** ↵  
 Select 1st object [U/P/R/T/M] : **M** ↵  
 Select 1st object [U/P/R/T/M] : **pick (H)** ↵  
 Select 2nd object : **pick (I)** ↵  
 Select 1st object [U/P/R/T/M] : **pick (H<sub>1</sub>)** ↵  
 Select 2nd object : **pick (I<sub>1</sub>)** ↵  
 Select 1st object [U/P/R/T/M] : **(enter)** ↵

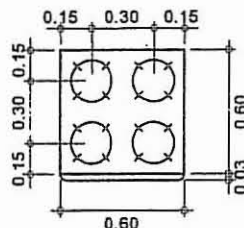


## STEP #5 (RECTANG)

Command : **REC** ↵  
 1st cor. pt [C/E/F/T/W] : **End pt. (J)** ↵  
 Other cor. pt. [A/D/R] : **@0.05,-0.05** ↵

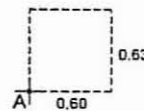
## STEP #6 (ZOOM (all) then QSAVE)

## RANGE

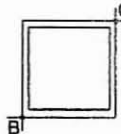


## STEP #1 (RECTANG)

Command : **REC** ↵  
 1st cor. pt [C/E/F/T/W] : **pick pt. (A)** ↵  
 Other cor. pt. [A/D/R] : **@0.60,0.63** ↵

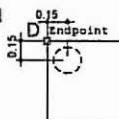


Command : **ZOOM** ↵  
 Options <real time> : **pick (B)** ↵  
 Opposite corner : **pick (C)** ↵



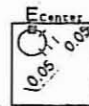
## STEP #2 (CIRCLE and OSNAP FROM)

Command : **C** ↵  
 Center pt. for circle [3P/2P/Ttr] : **From** ↵  
 Base point : **End of (D)** ↵  
 <Offset> : **@0.15,-0.15** ↵  
 Radius of circle [D] <> : **0.075** ↵



## STEP #3 (LINE and TEMPORARY TRACKING)

Command : **L** ↵  
 Specify first point : **From** ↵  
 Base point : **Cen of (E)** ↵  
 <Offset> : **@0.05<45** ↵  
 Specify next point or [Undo] : **@0.05<45** ↵  
 Specify next point or [Undo] : **enter** ↵



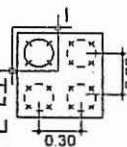
## STEP #4 (ARRAY (polar))

Command : **-AR** ↵  
 Select objects : **pick (F)** ↵  
 Select objects : **enter** ↵  
 Enter the type of array [R/P] : **P** ↵  
 Specify center point of array : **Cen of (G)** ↵  
 Number of items in the array : **4** ↵  
 Specify the angle to fill : **360** ↵  
 Rotate arrayed-objs.? [Y/N] : **Y** ↵



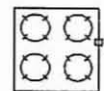
## STEP #5 (ARRAY (rectangular))

Command : **-AR** ↵  
 Select objects : **pick (H)** ↵  
 Select objects : **pick (I)** ↵  
 Enter the type of array [R/P] : **R** ↵  
 Number of rows (—) <1> : **2** ↵  
 Number of columns (|||) <1> : **2** ↵  
 Dist. bet. rows or specify unit cell (—) : **0.30** ↵  
 Distance between columns (|||) : **0.30** ↵

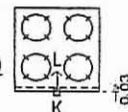


## STEPS #6 (EXPLODE and OFFSET)

Command : **X** ↵  
 Select objects : **pick (J)** ↵  
 Select objects : **enter** ↵

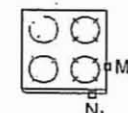
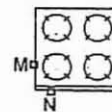


Command : **O** ↵  
 Distance or [T/E/L] : **0.03** ↵  
 Object to offset <exit> [E/U] : **pick (K)** ↵  
 Point on side to offset [E/M/U] : **pick (L)** ↵  
 Object to offset <exit> [E/U] : **(enter)** ↵



## STEP #7 (FILLET (radius = 0.03))

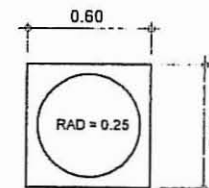
Command : **F** ↵  
 Select 1st obj. [U/P/R/T/M] : **R** ↵  
 Fillet radius <0.03> : **enter** ↵  
 Select 1st obj. [U/P/R/T/M] : **M** ↵  
 Select 1st obj. [U/P/R/T/M] : **pick M** ↵  
 Select 2nd obj. : **pick (N)** ↵  
 Select 1st obj. [U/P/R/T/M] : **pick (M<sub>1</sub>)** ↵  
 Select 2nd obj. : **pick (N<sub>1</sub>)** ↵  
 Select 1st obj. [U/P/R/T/M] : **(enter)** ↵



## STEP #8 (ZOOM (all) then QSAVE)

## 6. DRYER

## STEP #1 (POLYGON (circumscribed))



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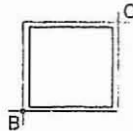
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Command : **POL** ↵  
 Number of sides <4> : **enter**  
 Center of polygon or [Edge] : **pick (A)**  
 [Inscribed / Circumscribed] <I>: **C** ↵  
 Radius of circle : **0.30** ↵

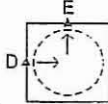


Command : **ZOOM** ↵  
 Options <real time> : **pick (B)**  
 Opposite corner : **pick (C)**



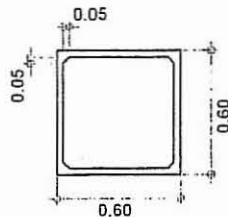
## STEP #2 (CIRCLE and TRACKING)

Command : **C** ↵  
 Center pt. for circle [3P/2P/Ttr] : **TK** ↵  
 1<sup>st</sup> tracking point : **Mid of (D)**  
 Next pt. (Press ENTER) : **Mid of (E)**  
 Next pt. (Press ENTER) : **enter**  
 Radius of circle or [Diameter] : **0.25** ↵



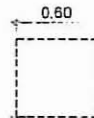
## STEP #3 (ZOOM extents then QSAVE)

## 7. WASHING MACHINE

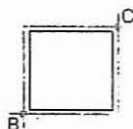


## STEP #1 (POLYGON (edge))

Command : **POL** ↵  
 Number of sides <4> : **enter**  
 Center of polygon or [Edge] : **E** ↵  
 1<sup>st</sup> endpoint of edge : **pick pt. (A)**  
 2<sup>nd</sup> endpoint of edge : **@0.60<0** ↵

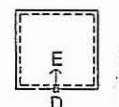


Command : **ZOOM** ↵  
 Options <real time> : **pick (B)**  
 Opposite corner : **pick (C)**



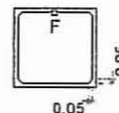
## STEP #2 (OFFSET)

Command : **O** ↵  
 Offset dist. or [T/E/L] : **0.05** ↵  
 Sel. obj. to offset [E/U] : **pick (D)**  
 Pt. on side to offset [E/M/U] : **pick (E)**  
 Select obj. to offset [E/U]<exit> : **enter**



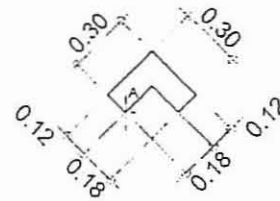
## STEP #3 (CHAMFER)

Command : **CHA** ↵  
 Select 1<sup>st</sup> line [P/D/A/T/M] : **D** ↵  
 First chamfer dist. <0.0000> : **0.05** ↵  
 Second chamfer dist. <0.0500> : **enter**  
 Select 1<sup>st</sup> line [P/D/A/T/M] : **P** ↵  
 Select 2D polyline : **pick (F)**



## STEP #4 (ZOOM (all) then QSAVE)

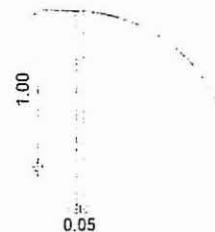
## 8. ARROW HEAD



## STEP #1 (PLINE)

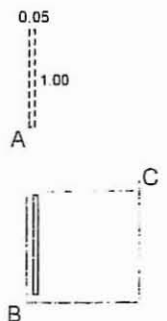
Command : **PL** ↵  
 Specify start point : **pick any point**  
 Specify next pt. or [A/H/L/U/W] : **@0.18<45** ↵  
 Specify next pt. or [A/H/L/U/W] : **@0.18<315** ↵  
 Specify next pt. or [A/H/L/U/W] : **@0.12<45** ↵  
 Specify next pt. or [A/H/L/U/W] : **@0.30<135** ↵  
 Specify next pt. or [A/H/L/U/W] : **@0.30<225** ↵  
 Specify next pt. or [A/H/L/U/W] : **C** ↵ (close)

## 9. DOOR



## STEP #1 (RECTANG)

Command : **REC** ↵  
 1<sup>st</sup> cor. pt [C/E/F/T/W] : **pick pt. (A)**  
 Other cor. pt. [Dim.] : **@0.05,1.00** ↵

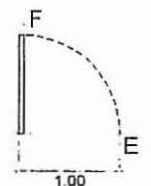


Command : **ZOOM** ↵  
 Options <real time> : **pick (B)**  
 Opposite corner : **pick (C)**

## STEP #2 (ARC)

click **DRAW** (pull down menu)  
 choose : **ARC**  
 choose : **Center, Start, End**

Center pt. of arc : **end of (D)**  
 Start pt. of arc : **@1<0** ↵  
 End point of arc or [A/L] : **end of (F)**



## STEP #3 (ZOOM extents then QSAVE)



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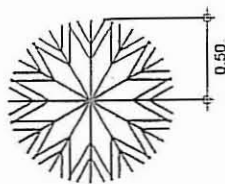
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## 10. TREE



## STEP #1 (CIRCLE)

Command : **C** ↵  
 Cent pt. for circle [3P/2P/Ttr] : **pick (A)**  
 Radius of circle or [Dia.] : **0.50** ↵

Command : **ZOOM** ↵  
 Options <real time> : **pick (B)**  
 Opposite corner : **pick (C)**

## STEP #2 (LINE)

Command : **L** ↵  
 Specify first point : **Qua of (D)**  
 Specify next point : **Gen of (E)**  
 Specify next point : **enter**

Command : **L** ↵  
 Specify first point : **Mid of (F)**  
 Specify next point : **Nea of (G)**  
 Specify next point : **enter**

Command : **L** ↵  
 Specify first point : **Nea (H)**  
 Specify next point : **Nea (I)**  
 Specify next point : **enter**

Command : **E** ↵  
 Select objects : **pick (J)**  
 Select objects : **enter**

## STEP #3 (MIRROR)

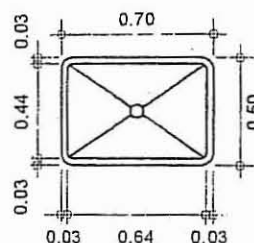
Command : **M** ↵  
 Select objects : **pick (K)**  
 Select objects : **pick (L)**  
 Select objects : **enter**  
 1<sup>st</sup> pt. of mirror line : **End of (M)**  
 2<sup>nd</sup> pt. of mirror line : **End of (N)**  
 Erase source objs.? <N> : **enter**

## STEP #4 (ARRAY (polar) )

Command : **-AR** ↵  
 Select objects : **pick (P)**  
 Other corner : **pick (Q)**  
 Select objects : **enter**  
 Enter the type of array [R/P] : **P** ↵  
 Specify center pt. of array : **end of (R)** ↵  
 Enter the no. of items in the array : **12** ↵  
 Specify the angle to fill (+ccw, -cw) <360> : **enter**  
 Rotate arrayed objects? [Y/N] <Y> : **enter**

## STEP #5 (ZOOM extents then QSAVE)

## 11. LTUB



## STEP #1 (RECTANG)

Command : **REC** ↵  
 1<sup>st</sup> corner [C/E/F/T/W] : **E** ↵  
 Radius <0.0300> : **0.06** ↵  
 1<sup>st</sup> cor pt [C/E/F/T/W] : **pick pt. (A)**  
 Other cor. pt. [A/D/R] : **@0.70,0.50** ↵

Command : **ZOOM** ↵  
 Options <real time> : **pick (B)**  
 Opposite corner : **pick (C)**

## STEP #2 (OFFSET)

Command : **O** ↵  
 Offset dist. or [T/E/L] : **0.03** ↵  
 Select obj. to offset [E/U] : **pick (D)**  
 Point on side to offset : **pick (E)**  
 Select obj. to offset <exit> : **enter**

## STEP #3 (LINE)

Command : **L** ↵  
 Specify first point : **Mid of (F)**  
 Specify next point : **Mid of (G)**  
 Specify next point : **enter**

Command : **L** ↵  
 Specify first point : **Mid of (H)**  
 Specify next point : **Mid of (I)**  
 Specify next point : **enter**

## STEP #4 (CIRCLE)

Command : **C** ↵  
 Center pt. for circle [3P/2P/Ttr] : **Int of (J)**  
 Radius of circle or [Diameter] : **0.03** ↵

## STEP #5 (TRIM)

Command : **TR** ↵  
 Select objects : **pick (K)** (circle)  
 Select objects : **enter**  
 Select obj. to trim or [P/E/U] : **pick (L)** (trim lines inside the circle)  
 Select obj. to trim or [P/E/U] : **enter**

## STEP #6 (ZOOM extents then QSAVE)



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## BLOCKING / CREATING A TEMPLATE

## A: GROUPING ENTITIES

1. **GROUP** - command to group objects together as one unit. Grouped objects can not be retrieved or inserted.
2. **BLOCK** - command to join objects together and store it in a current file's block reference table for later retrieval. Templates created using BLOCK command can not be retrieved in another file using Insert or Minsert command.
3. **WBLOCK** - command to write a drawing file from selected objects on screen or from a block in the current file's block reference table. Drawing files can be retrieved in any current DWG file.
4. **SAVE/SAVEAS**-command to save the drawing under the current file name, or enter a different file name to save a copy of the drawing under that name.

## B: MERGING BLOCKS

1. **INSERT** - To import a template created using BLOCK/WBLOCK/SAVE commands
2. **MINsert** - Multiple insert, imports a template and array it rectangularly.
3. **DESIGN CENTER** - Can be used to insert blocks into a current dwg.

## C: EDITING TEMPLATES FROM THE BLOCK REFERENCE TABLE

1. **EXPLODE** - to break inserted blocks or dwgs into its component parts / primitives
2. **PURGE** - to delete unused templates from the Block Reference Table.
3. **RENAME** - to change name of a template in the Block Reference Table
4. **REFEDIT** - to Edit References in Place
5. **BLOCK EDITOR** - to define dynamic behavior for a block definition

## GROUP

Exer. # 1: Use the GROUP command to create a saved set of objects

Command : G (enter)

-In the Object Grouping dialog box,

1. Under **Group Identification**, enter a group name and a description.

eg. NAME : WC

2. Choose New.

-The dialog box closes temporarily.

-Select objects and press ENTER.

3. Choose OK.

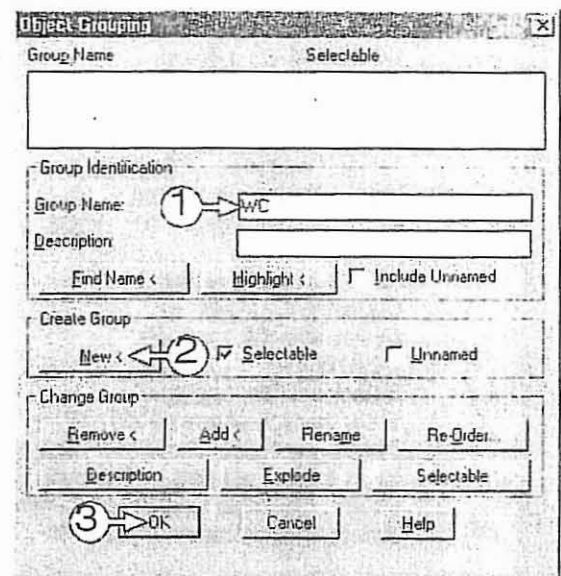


fig. VIII-1. Showing Object Grouping dialog box



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Use the BLOCK command to create templates for WC & LAV

Command : **B (enter)**

In the Block Definition dialog box

1. Enter a name for the block.

eg. Name : **WC**

2. Base Point,

choose the **Pick point** button

Specify Insertion Base Point using the pointing device.

eg. Insertion basepoint. : **MID of (A)**

3. Objects,

choose the **Select Objects** button.

Use the pointing device to select objects for the block definition

(EX.) Select obj.(s). : **Pick B & C**

4. Settings,

Specify whether to **retain**, **convert to block**, or **delete** the selected objects.

5. Block units,

Choose **Meter**

6. Uncheck **Scale uniformly**

Select (check) **Allow exploding**

7. Description, (optional)

enter text to help identify the block for easy retrieval.

1. Choose **OK**. The block definition is saved in the current drawing.

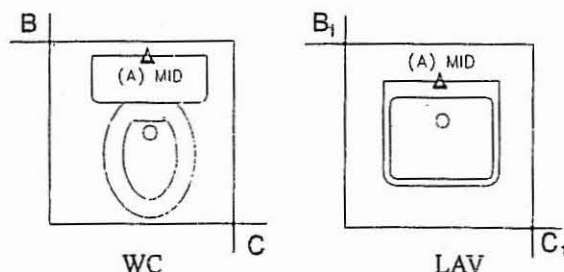


fig. VIII-2. Showing fixtures and their base points.

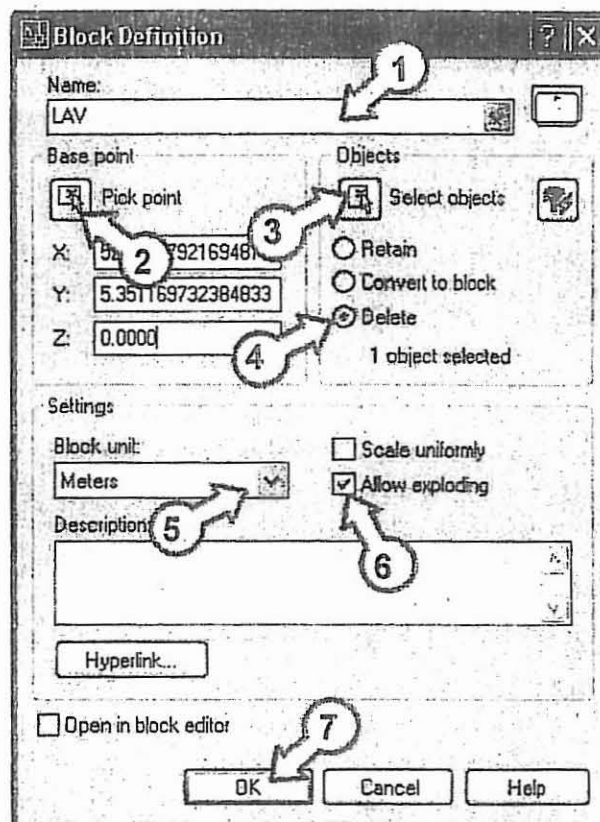


fig. VIII-3. Dialog box of block definition

2. List templates in the block reference table

Command : **B (enter)**

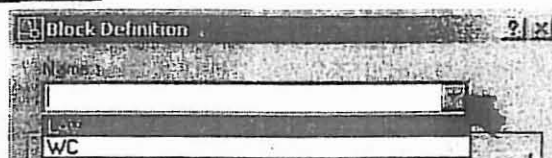


fig. VIII-4. Showing list of blocks



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**INSERT**

Exer. # 4: Insert LAV. Use x&y scale factors to resize and rotate the templates.

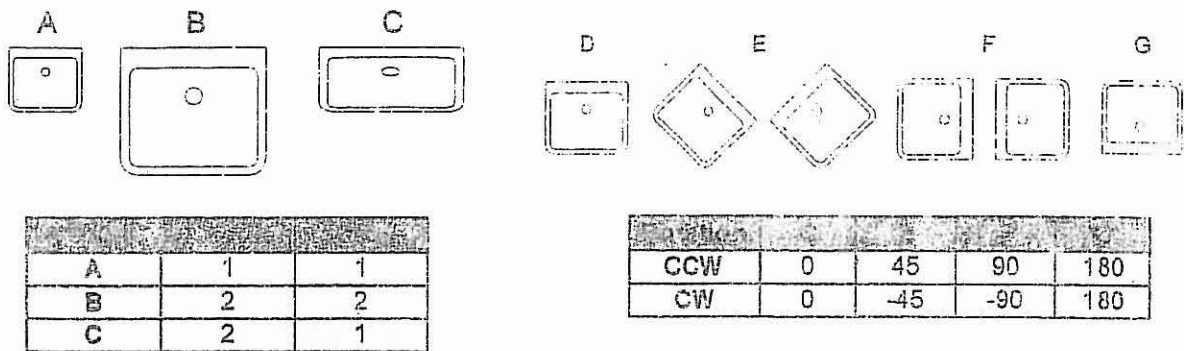


fig.VIII- 5. Showing about scale

fig.VIII-6. Showing about rotation

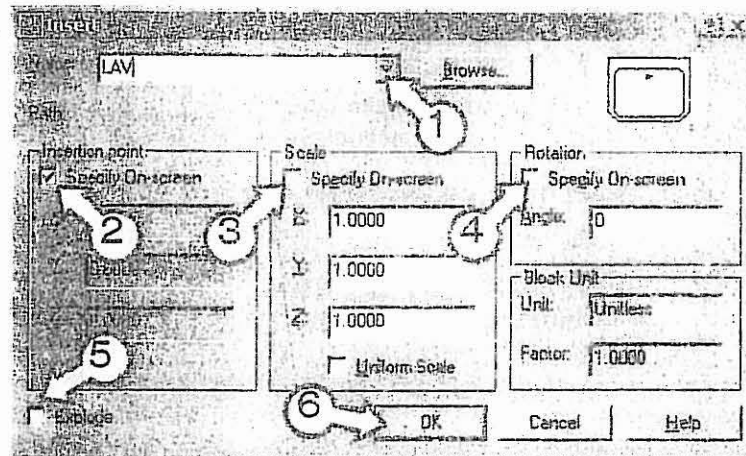


fig.VIII-7. Showing Insert dialog box



Command : I (enter)

In the Insert dialog box, specify the block name, where you want to insert it in the current drawing and whether you want to explode it after insertion.

Choose **OK**.

Specify insertion point or

[Basepoint/Scale/X/Y/Z/Rotate/PScale/PX/PY/PZ/PRotate]: pick any point

**EXPLODE**

Breaks a compound object into its component objects

A compound object comprises more than one AutoCAD object. A Block is an example of a compound object. You can explode 3D meshes, 3D solids, blocks, bodies, dimensions, multilines, polyface meshes, polygon meshes, polylines, and regions.

Exer. # 5: Explode the LAV template.



Command : X (enter)

Select objects : pick an object (lav)

Select objects : press enter



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**WBLOCK**

Exer. # 8: Save a block as a separate drawing file

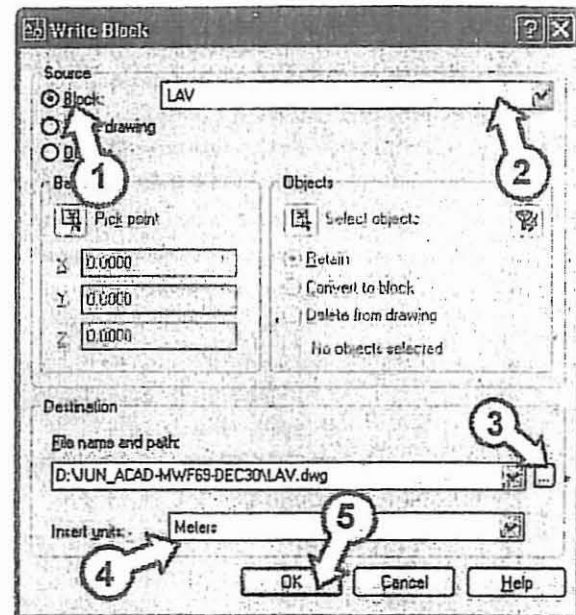
Command : W (enter)In the Write block dialog box,  
Under Source,

1. Choose **Block**
2. Beside **Block**, choose a block object name

 If a block is selected, **WBLOCK** automatically uses that block's name for the new file.

3. Click the ellipsis button to browse the folder and assign the filename.
4. Set insert units to **METERS**
5. Choose **OK**.

The block definition is saved as a drawing file.



Exer. # 9: Save selected objects on screen as a separate drawing file

Command : W (enter)In the Write Block dialog box,  
Under Source,

1. Choose **Objects**

Under Base point,

2. Choose **Pick point** button to specify the base point

Under Objects,

3. Choose **Select objects** button to select the object for the block file.
4. Choose **Retain**

Under Destination,

5. Specify the **File name and path**
6. In the **Insert Units** list, choose **METERS**
8. Choose **OK**.

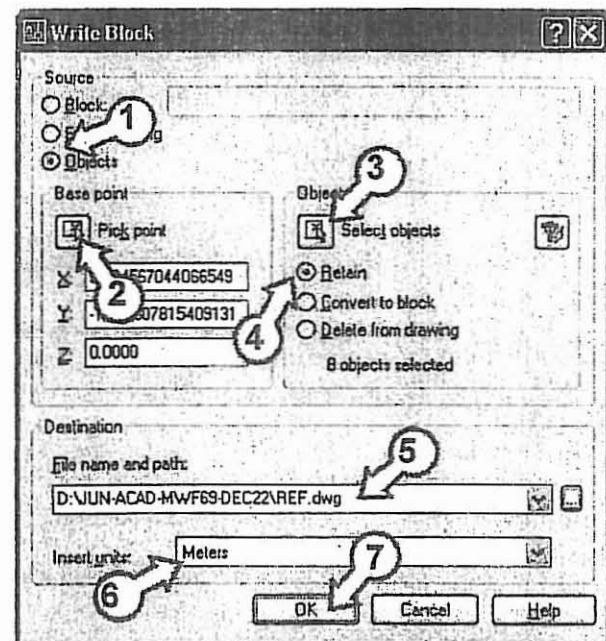


fig. F111-9

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**RENAME**

Exer. # 8: Rename a named object (Block)

To rename a named object

**Command:** RENAME

1. In the Rename dialog box under **Named Objects**, select the object type (Blocks).
2. Select the named object from the **Items** list, or enter the name in **Old Name**.
3. In **Rename To**, enter the new name.
4. Click **Rename To** button.
5. Choose **OK**.

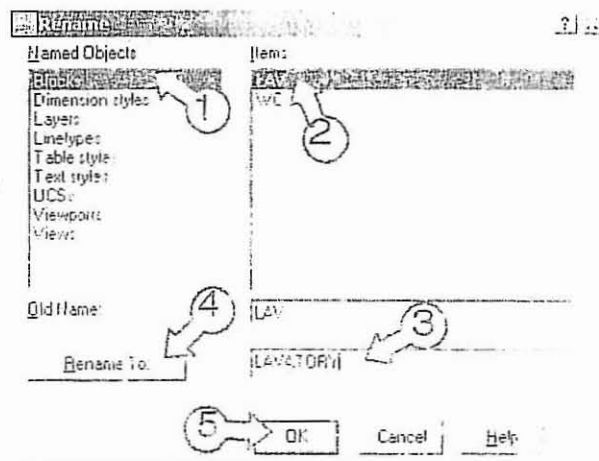


fig. VIII-10. Showing Rename dialog box

**PURGE**

Exer. #9: Remove unused named objects from the drawing database

**Command :** PU (enter)

The Purge dialog box displays a tree view of object types with items that can be purged.

1. To purge unreferenced blocks, use one of the following methods:  
To purge all unreferenced blocks, select blocks.  
To purge specific blocks, double-click blocks to expand the tree view. Then select the blocks to be purged.

If the item you want to purge is not listed, select **View Items You Cannot Purge**.

2. You are prompted to confirm each item in the list.
3. Choose **Purge**.  
To confirm the purging of each item, respond to the prompt by choosing **Yes** or **No**, or **Yes to All** if more than one item is selected.
4. Choose **Close**.

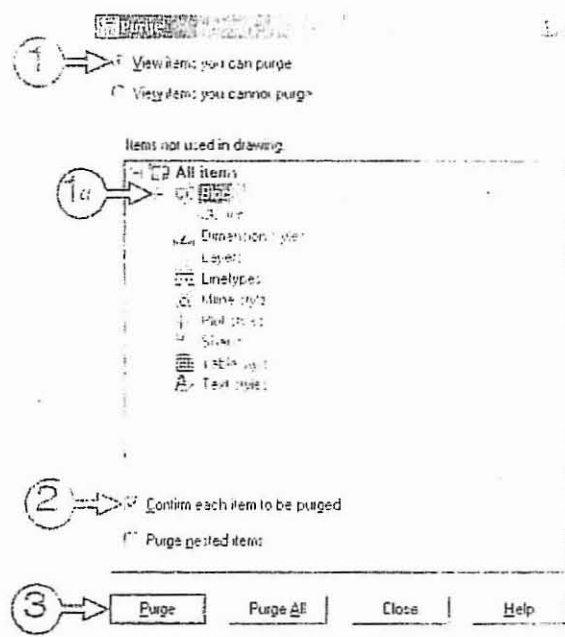


fig. VIII-11. Showing Purge dialog box

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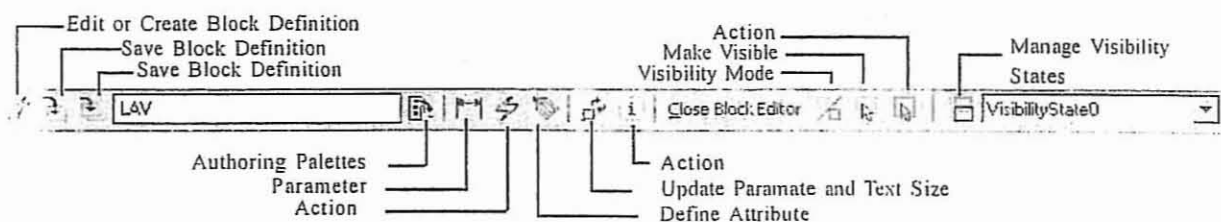
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A dynamic block has flexibility and intelligence. A dynamic block reference can easily be changed in a drawing while you work. You can manipulate the geometry in a dynamic block reference through custom grips or custom properties. This allows you to adjust the block in-place as necessary rather than searching for another block to insert or redefining the existing one.



**Parameters**

- Point Parameter
- Polar Parameter
- Linear Parameter
- XY Parameter
- Rotation Parameter
- Alignment Parameter
- Flip Parameter
- Visibility Parameter
- Lookup Parameter
- Base Point Parameter

**Actions**

- Move Action
- Scale Action
- Stretch Action
- Polar Stretch Action
- Rotate Action
- Flip Action
- Array Action
- Lookup Action

**Parameters**

**Actions**

**Parameter Sets**

**Parameter Sets**

**Block Authoring Palettes - All Palettes**

|            |      |         |       |       |                  |        |      |        |
|------------|------|---------|-------|-------|------------------|--------|------|--------|
| ALIGNMENT  |      |         |       |       |                  |        |      |        |
| VISIBILITY |      |         |       |       |                  |        |      |        |
| BASE POINT |      |         |       |       |                  |        |      |        |
| POINT      | ✓    | ✓       |       |       |                  |        |      |        |
| LINEAR     | ✓    | ✓       | ✓     | ✓     |                  |        |      |        |
| POLAR      | ✓    | ✓       | ✓     | ✓     | ✓                |        |      |        |
| XY         | ✓    | ✓       | ✓     | ✓     |                  |        |      |        |
| ROTATION   |      |         |       |       |                  | ✓      |      |        |
| FLIP       |      |         |       |       |                  |        | ✓    |        |
| LOOKUP     |      |         |       |       |                  |        |      | ✓      |
|            | MOVE | STRETCH | SCALE | ARRAY | POLAR<br>STRETCH | ROTATE | FLIP | LOOKUP |

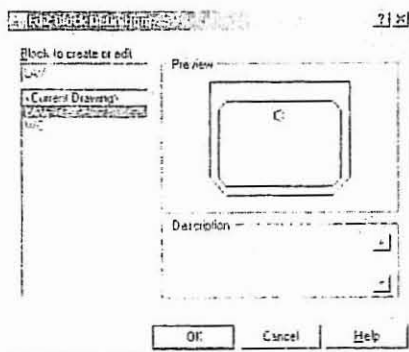
### Actions

Actions define how the geometry of a dynamic block reference will move or change when the block reference is manipulated in a drawing. When you add actions to the block, you must associate them with parameters and usually geometry.

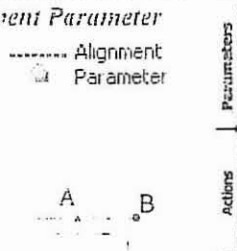
|                                                                                          |                                                                                  |                                                          |                                               |                                                               |                                                              |                                                 |                                                                                                                                                   |         |
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I. To Apply *Alignment Parameter*

1. Select the block, right-click >> choose Block Editor... or at the command prompt, apply **BE**, then select the block name, click OK.

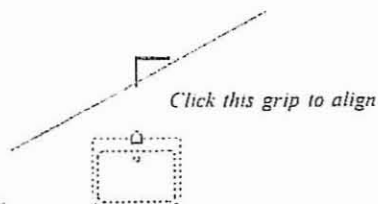


2. Click Parameters tab, select *Alignment Parameter*

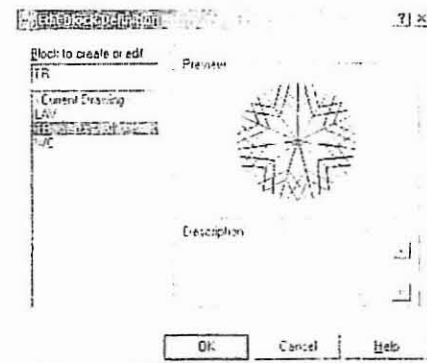


Specify base point of alignment or [Name]: mid A  
Specify alignment direction or alignment type [Type] <Type>: T  
Enter alignment type [Perpendicular/Tangent] <Perpendicular>: P  
Specify alignment direction or alignment type [Type] <Type>: end B

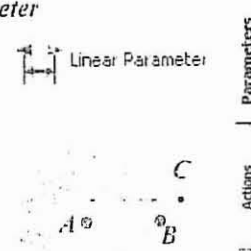
3. Click **Close Block Editor** button  
4. Click **Yes** to save the changes.  
5. To align the block, select the block, click the grip and drag the block to the object where it is to be aligned

II. To Apply *Scale Parameter & Action*

1. Select the block, right-click >> choose Block Editor... or at the command prompt, apply **BE**, then select the block name, click OK.

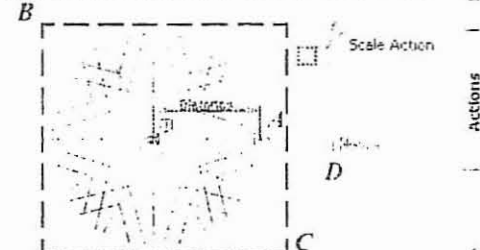


2. Click Parameters tab, select *Linear Parameter*



Specify start point or [Name/Label/Chain/Description]:  
Base/Palette/Value set: int A  
Specify endpoint: end B  
Specify label location: pick C

3. Click Actions tab, select *Scale Action*



Select parameter: pick A  
Select objects: pick B  
Specify opposite corner: pick D

3. Click **Close Block Editor** button  
4. Click **Yes** to save the changes.



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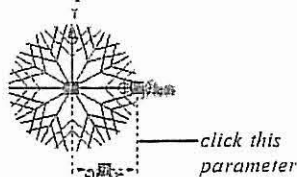
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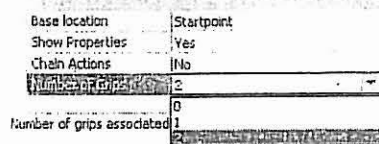
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## I. To Control the number grips

1. Click the block >> right-click >> Block Editor
2. Click the parameter.



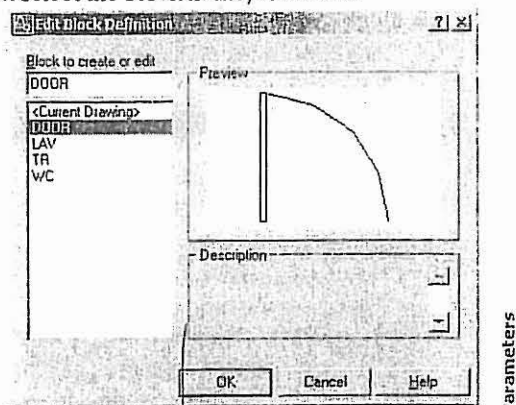
3. Click Properties icon.
3. In the Properties window, set the number of grips.



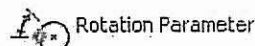
4. Click Close Editor button.
5. Click Yes to save.

## III. To Apply Rotate Parameter &amp; Action

1. Select the block, right-click >> choose Block Editor... or at the command prompt, apply **BE**, then select the block name, click OK.

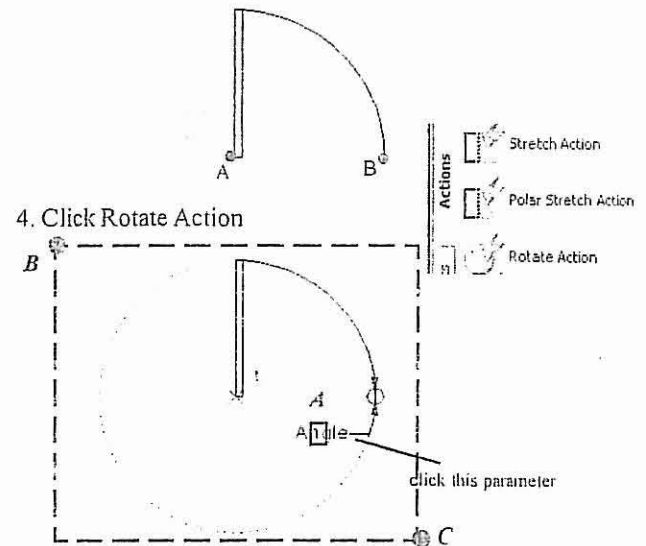


2. Click Rotate Parameter.



3. From the command line window,

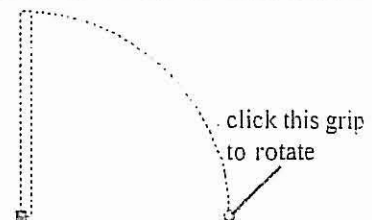
Specify base point or [Name/...]: **End A**  
Specify radius of parameter: **End B**  
Specify default rotation angle or [Base angle]: <0°: **enter**



5. From the command line,

Select parameter: **pick A**  
Select objects: **pick B**  
Specify opposite corner: **pick C**  
Select objects: **enter**  
Specify action location or [Base type]: **enter**

6. Click Close Editor button. Click Yes to save.



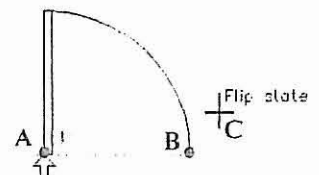
## IV. To Apply Flip Parameter &amp; Action

1. Select the block, right-click >> choose Block Editor... or at the command prompt, apply **BE**, then select the block name, click OK.
2. Click Flip Parameter.



3. From the command line,

Specify base point of reflection line or [Name/Label/Description/Palette]: **End A**  
Specify endpoint of reflection line: **End B**  
Specify label location: **pick C**



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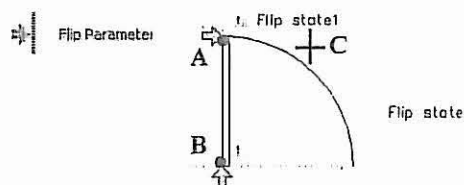
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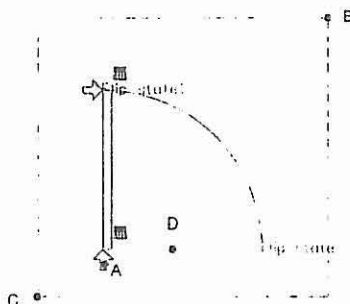
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4. Click **Flip Parameter**.

5. From the command line,  
Specify base point of reflection line or [Name/Label/Description/Palette]: End A  
Specify endpoint of reflection line: End B  
Specify label location: pick C

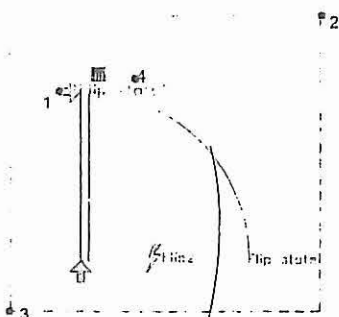
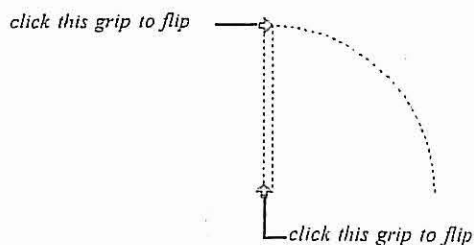
## 6. Click Action tab. Click Flip Action.



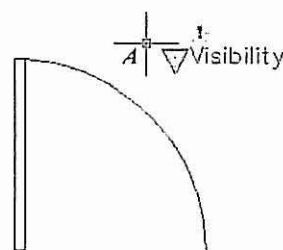
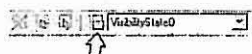
- Select parameter: pick A  
Select objects: pick B  
Specify opposite corner: pick C  
Select objects: (enter)  
Specify action location: pick D

## 7. Click Flip Action again.

- Select parameter: pick 1  
Select objects: pick 2  
Specify opposite corner: pick 3  
Select objects: (enter)  
Specify action location: pick 4

8. Click **Close Editor** button. Click **Yes** to save.V. To Apply **VisibilityParameter**

1. Select the block, right-click >> choose **Block Editor...** or at the command prompt, apply BE, then select the block name, click OK.

2. Click **Visibility Parameter**.Specify parameter location: pick A

3. Click **Manage Visibility States** icon  
4. Click **Rename**. Change the default name.  
5. Click **New**. Add new names.

**New Visibility State**

Visibility state name  
[0.90]

Visibility options for new states

☐ Hide all existing objects in new state

☐ Show all existing objects in new state

☒ Leave visibility of existing objects unchanged in new state

OK Cancel Help



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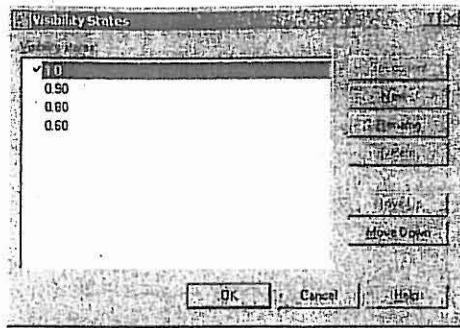
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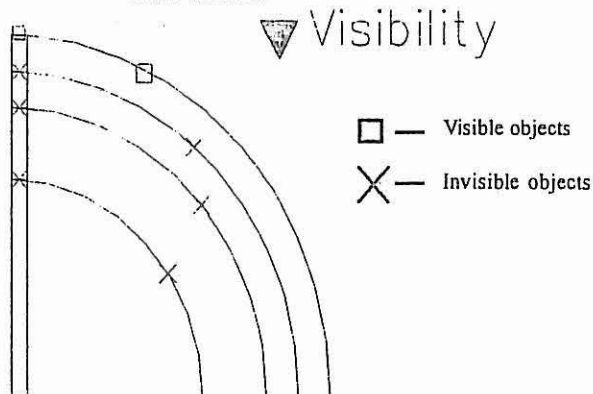
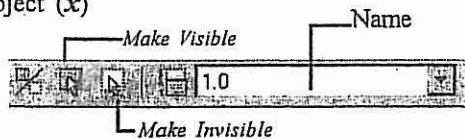
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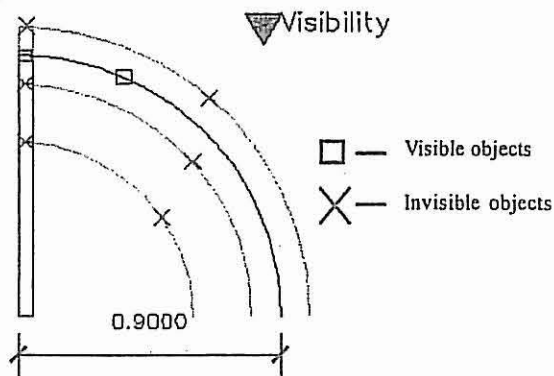


6. Draw the other door size.

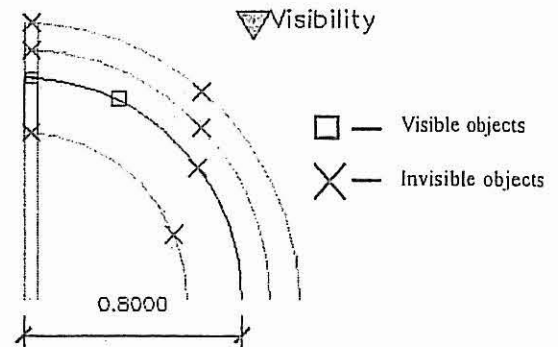
7. Select the name. (i.e. 1.0). Click **Make Visible**, click the objects (□). Click **Make Invisible**, click the object (x)



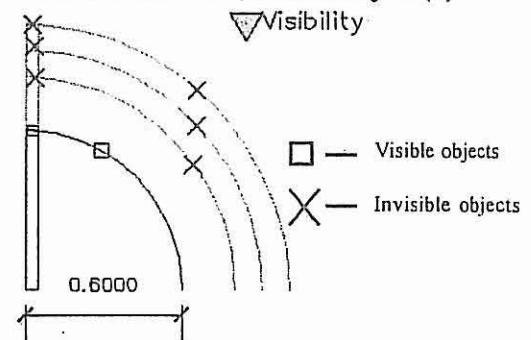
8. Select the name. (0.90).  
9. Click **Make Visible**, click the objects (□).  
10. Click **Make Invisible**, click the object (x)



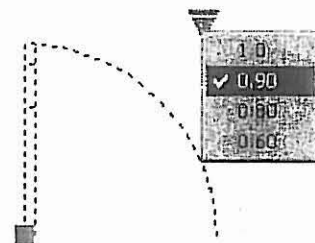
11. Select the name. (0.80).  
12. Click **Make Visible**, click the objects (□).  
13. Click **Make Invisible**, click the object (x)



14. Select the name. (0.60).  
15. Click **Make Visible**, click the objects (□).  
16. Click **Make Invisible**, click the object (x)



14. Click **Close Editor** button. Click **Yes** to save.  
15. Select the door symbol. Click the grip. ▽



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**AutoCAD**

## DESIGN CENTER

The Design Center provides direct access to content on your desktop, network, Web, and to locate and load content, such as blocks, layers, and named objects, into your drawings.

- Browse different drawing content
- View the block and layer definitions of drawing files
- Insert, attach, or copy and paste definition into a current dwg.
- Open drawing by dragging a file from tree view into a drawing editor
- View and attach raster image file into a drawing area

### The Design Center Window

**Folders** | FOLDERS - List local and network drive

**Open Drawings** | OPEN DRAWINGS - List drawings that are open

**History** | HISTORY - List last 20 locations accessed through Design Center

 **TREE VIEW TOGGLE** - Displays or hides tree view

 **FAVORITES** - Displays shortcuts to files or to folders stored in the Favorites folder

 **HOME** - Returns DesignCenter to your home folder.

 **LOAD** - Displays load Design Center palette dialog box.

 **SEARCH** - Displays Search Dialog box.

 **UP** - Moves one level from current location

 **PREVIEW** - Displays an image of an object in a window at the bottom of tree pane

 **DESCRIPTION** - Displays text description of an object in a window at the bottom of tree pane

 **VIEWS** - Provides four different display formats for content loaded in palette

Command : DC (enter)

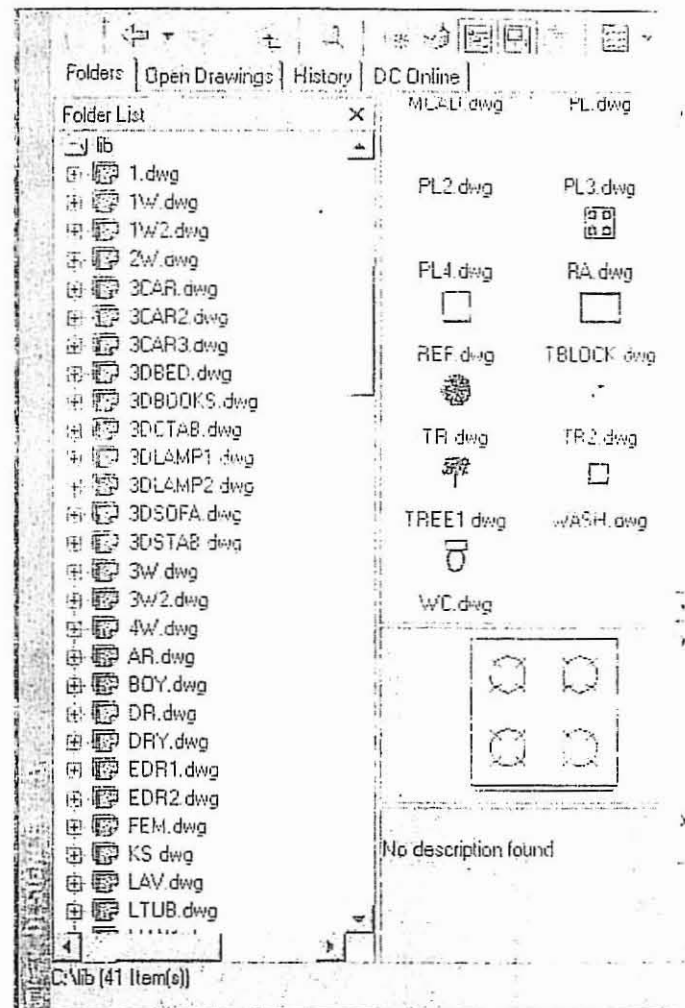


fig. VIII-12. Showing Design Center Palette



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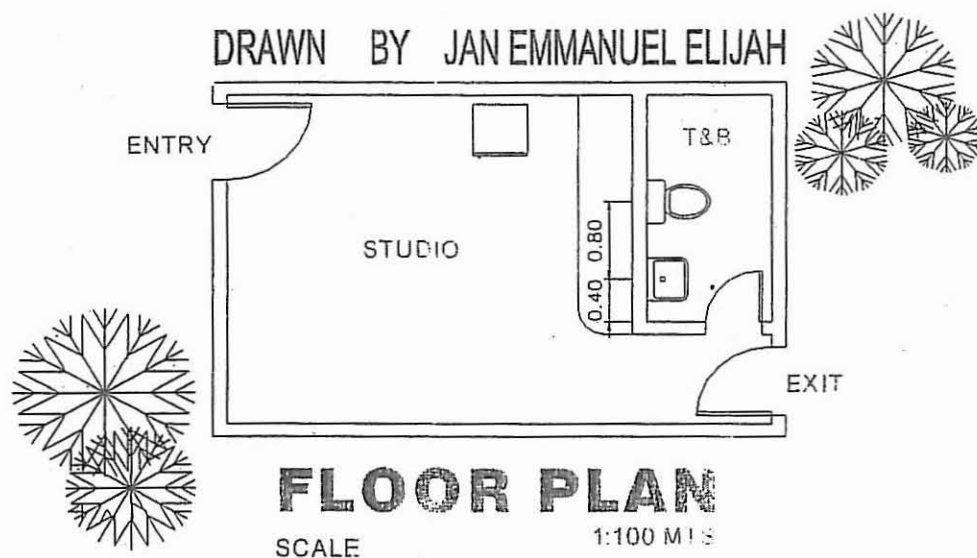
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**AutoCAD**

Exer. # 10: Insert REF, LAV, WC, TR and DR at Studio.dwg file using AutoCAD Design Center as shown below

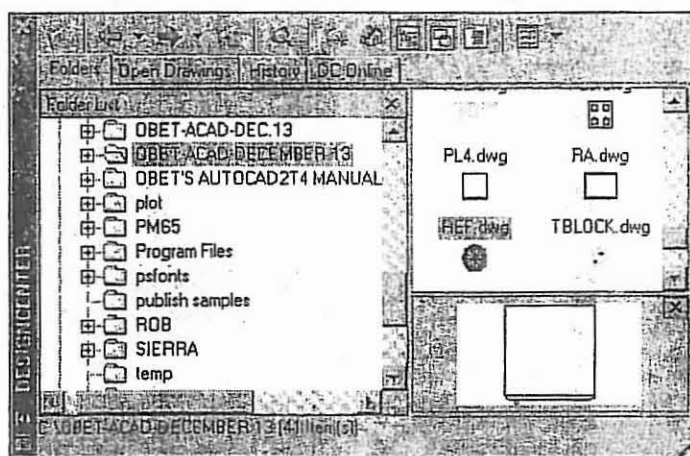


#### A. SET THE FOLLOWING PARAMETERS

1. SNAP (ON)  
Polar distance = 0.40
2. OSNAP (ON)  
Set = EXTENSION

#### B. OPEN DESIGN CENTER

Command : ADC (enter)



using REFEDIT, blocks can be edited without exploding (SEE NEXT PAGE)



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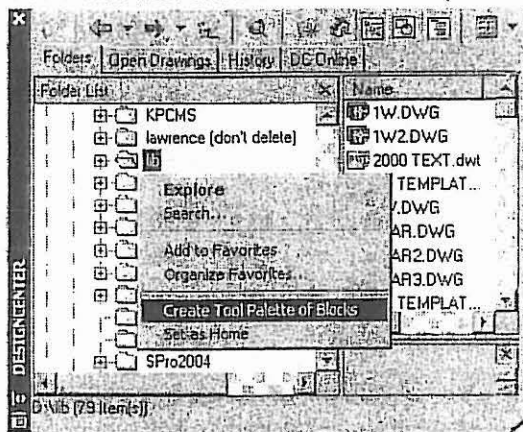
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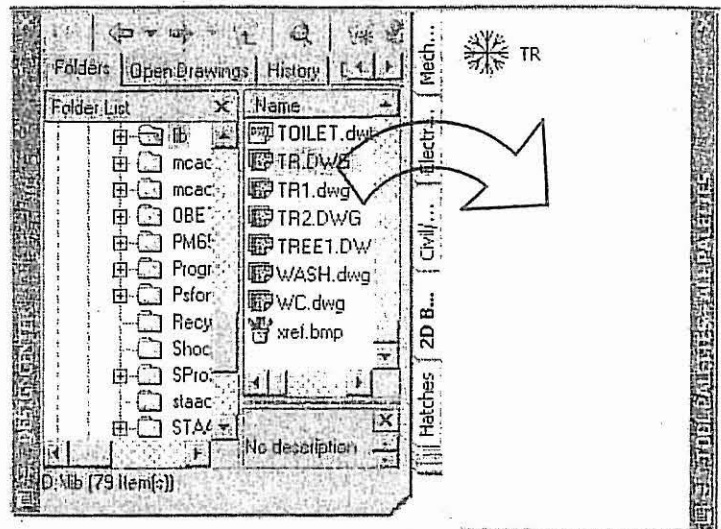
**AutoCAD**

## Tool Palettes

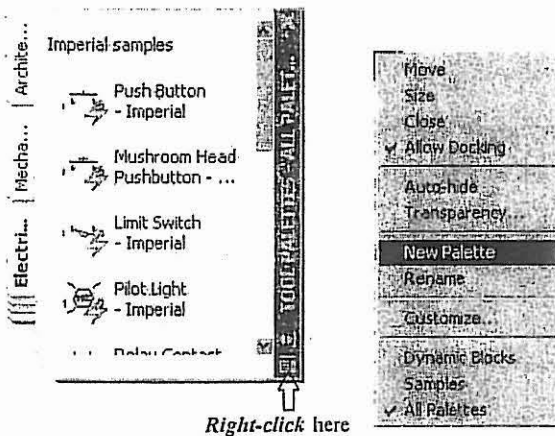
### I. To Create Tool Palette tab from Folder(i.e. )



### IV. To Add Tool by DRAG & DROP (from Design Center)

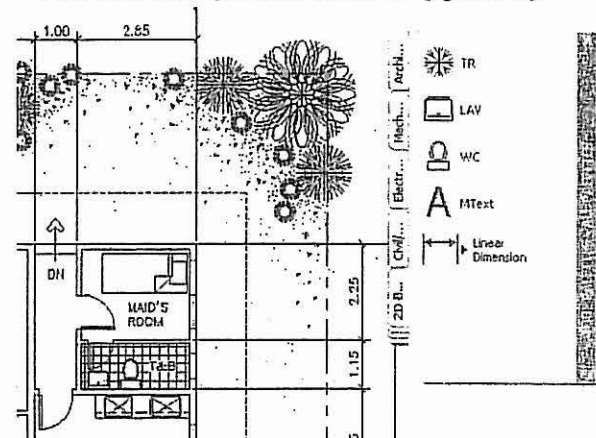


### II. To Create New Palette Tab

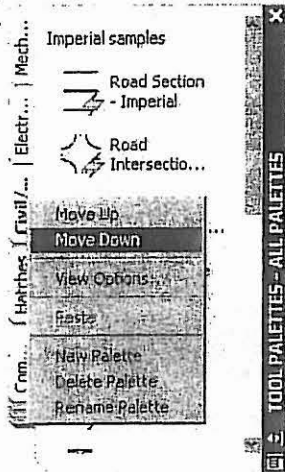


Right-click here

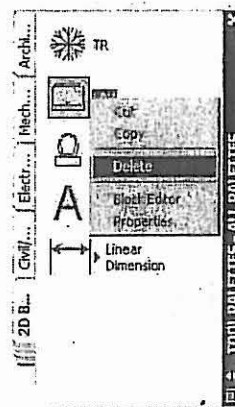
### V. To Add Tool by DRAG & DROP of geometry



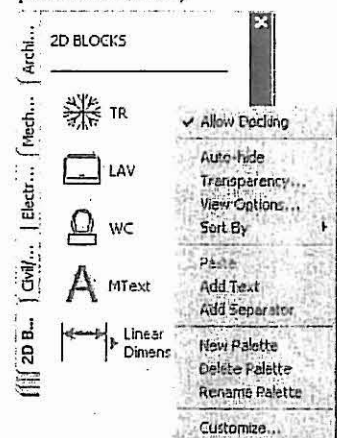
### III. To Rename/Delete Palette Tab, right-click on palette tab to access the shortcut menu.



### VI. To Delete a Tool, right-click on tool.



### VII. To Add Text & Separator (use right-click on palette window)



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**AutoCAD**



## REFEDIT

You can modify external references and redefine block definitions from within the current drawing by using in-place reference editing. Both blocks and xrefs are considered references.



Often, a drawing contains one or more xrefs as well as multiple block references. When working with block references, you can select a block, modify it, and update the block reference. When working with xrefs, you can use in-place reference editing to select the reference you want to work with, modify its objects, and save back the changes to the reference drawing. You can make minor changes without having to go back and forth between drawings.

See page 81 for more information about XREF

## XFADECTL

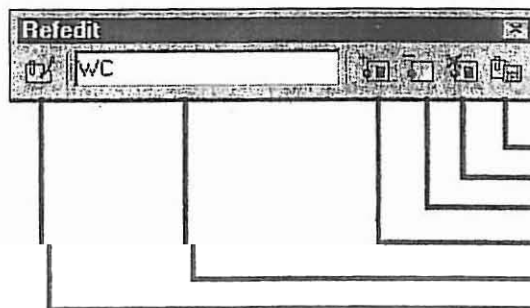
Controls the fading intensity for references being edited in-place.

- 0      0 percent fading, minimum value  
90     90 percent fading, maximum value

## XEDIT

Controls whether the current drawing can be edited in-place when being referenced by another drawing.

- 0      Can't use in-place reference editing  
1      Can use in-place reference editing



SAVE BACK CHANGES TO REFERENCE  
DISCARD CHANGES TO REFERENCE  
REMOVE OBJECTS FROM WORKING SET  
ADD OBJECTS TO WORKING SET  
REFERENCE NAME  
EDIT BLOCK OR XREF

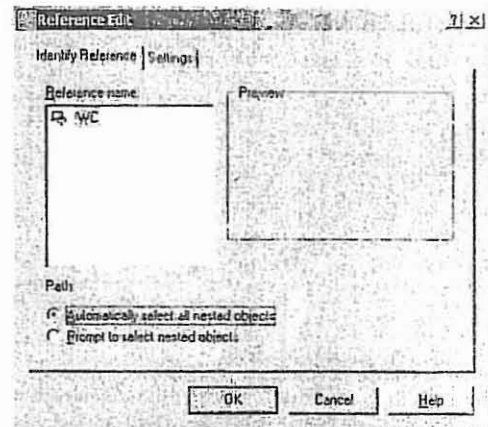


fig. VIII-13. Showing refedit toolbar

Exer. # 11: Use Refedit to modify WC

Command : **REFEDIT** (enter)  
Select reference : **pick WC** (local block)

- The WC is highlighted and the Reference Edit dialog box is displayed. Click **OK**

WC  
BEFORE

Select nested objects : **pick the three lines that form rectang above the WC** (enter)

Command : **F** (enter) (fillet the corner of the three lines with the radius of 0.03)

Command : **REFCLOSE** (enter)

Enter option [Save/Discard reference changes] <Save> : (enter)

WC  
AFTER



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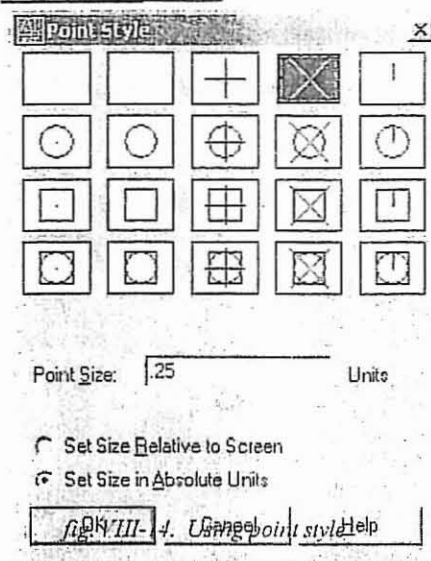
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## POINT, DIVIDE AND MEASURE

1. POINT - command to create a point onscreen
2. DDPTYPE - modifies point size and style

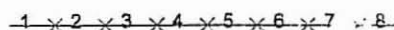
Command : **DDPTYPE** (enter)



## 3. DIVIDE

Marks off a specified number of equal lengths on selected object by placing point objects or blocks along the length or perimeter of the object. Valid objects that can be divided include arcs, circles, ellipses and elliptical arcs, polylines, and splines.

Exer. # 1: DIVIDE an object and use POINT as a marker

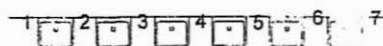


Command : **DIV** (enter)

Select object to divide : pick 1st line

Enter the number of segments or [Block] : 8

Exer. # 2: DIVIDE an object and use BLOCK as a marker



Command : **DIV** (enter)

Select object to divide : pick 2nd line

Enter the number of segments or [Block] : B

Enter name of block to insert : LAV

Align block with object? [Yes/No] <Y> : press enter

Enter the number of segments : 7

fig. VIII-15. Using DIVIDE



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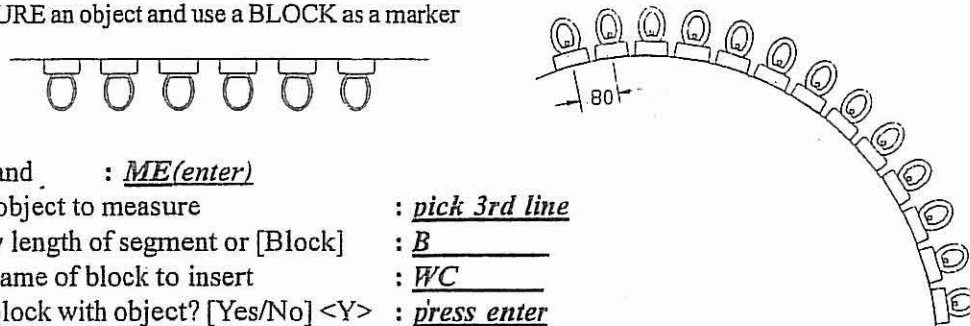
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**AutoCAD**

## 4. MEASURE

Marks off a specified segment lengths on selected object by placing point objects or blocks.

Exer. # 1: MEASURE an object and use a BLOCK as a marker



Command : ME(enter)  
 Select object to measure : pick 3rd line  
 Specify length of segment or [Block] : B  
 Enter name of block to insert : WC  
 Align block with object? [Yes/No] <Y> : press enter  
 Specify length of segment : 0.80

fig. VIII-16. Using MEASURE

## ATTRIBUTES

An informational text associated with a block

### A. Command associated

1. ATTDEF or DDATTDEF - command to create an attribute

Attribute modes:

- Invisible - Specifies that attribute values won't appear when you insert the block. (ATTDISP overrides invisible mode)
- Constant - Gives attribute a fixed value for block insertion
- Verify - Prompts attribute value twice
- Presets - Sets the attributes to its default value when you insert the block

Exer. # 1 Create a door tag using DDATDEF

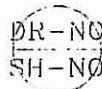
1. Create the 2D model using  
Circle (r=0.30) and Line



2. Create an attribute

Command : ATT(enter)

Define the mode; attribute tag, prompt, and value; insertion point; and text options for an attribute.



3. Use Wblock to create a file

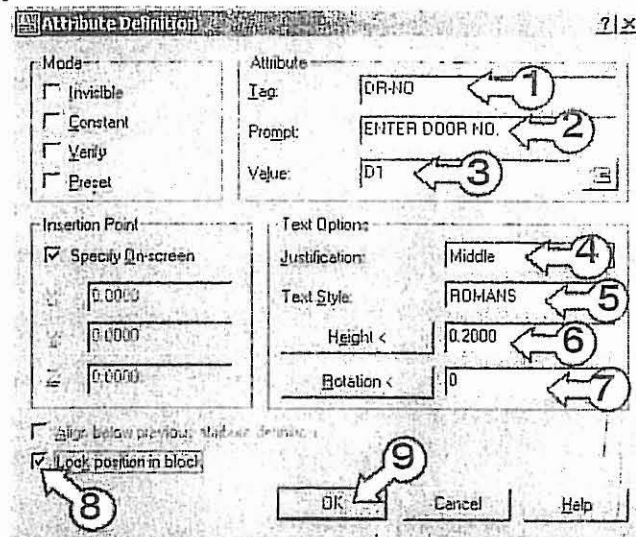


fig. VIII-17. Showing Attribute Definition dialog box



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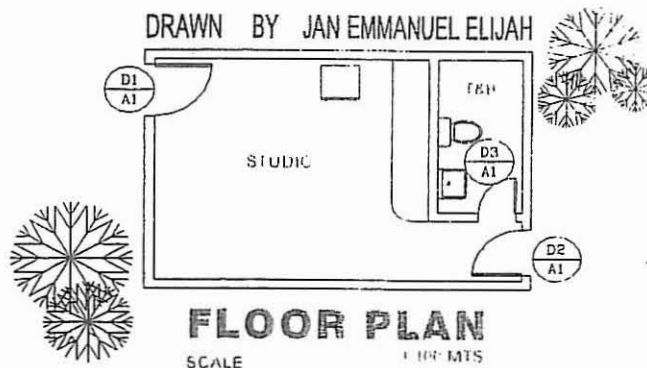
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Exer. # 2: Open studio file and insert call out (dtag.dwg) as shown below

Command : **I** (enter)



Exer. # 3: Edit attribute using DDATTE, ATTEDIT, EATTEDIT, BATTMAN

Command : **EATTEDIT** (enter) or double click an Attribute

Select block reference : **pick an attribute**

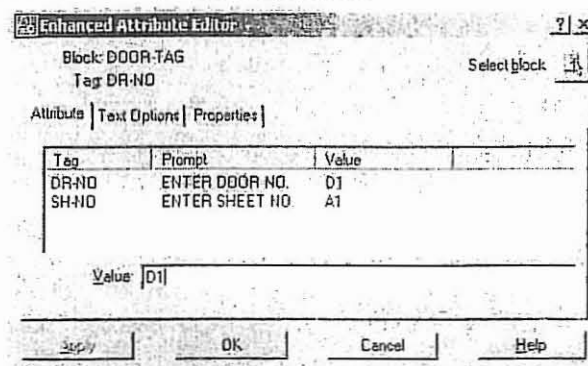


fig. VIII-18. Showing Enhanced Attribute Editor dialog box

## INQUIRY COMMANDS



1. **DIST** - Measures the distance and angle between two points.
2. **AREA** - Calculates the area and perimeter of objects or of defined areas.
3. **MASSPROP** - Calculates and displays the mass properties of regions or solids.
4. **LIST** - Displays database information for selected objects.
5. **ID** - Displays the coordinate values of a location.



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Exer. # 1: Use DIST, AREA commands to get measurements

### 1. LIST

Command : LI (enter)  
 Select objects : pick any existing text  
 Select objects : press enter  
 TEXT Layer: "0"  
 Space: Model space  
 Handle = 2E  
 Style = "Standard"  
 Font file = txt  
 start point, X= 7.8 Y= 4.8 Z= 0.0  
 height 0.2000  
 text studio  
 rotation angle 0  
 width scale factor 1.0000  
 obliquing angle 0  
 generation normal

### 2. DIST

Command : DI (enter)  
 Specify first point : END of (A)  
 Specify second point : END of (B)

Distance = 6.150, Angle in XY Plane = 0, Angle from XY Plane = 0  
 Delta X = 6.150, Delta Y = 0.0000, Delta Z = 0.0000

### 3. AREA

Command : AA (enter)  
 Specify first corner point or [Object/Add/Subtract] : END of (A)  
 Specify next corner point or press ENTER for total : END of (B)  
 Specify next corner point or press ENTER for total : END of (C)  
 Specify next corner point or press ENTER for total : END of (D)  
 Specify next corner point or press ENTER for total : press enter  
 Area = 25.5225, Perimeter = 20.6000

### 4. AREA with BOUNDARY

Command : BO (enter)  
 AutoCAD displays the Boundary Creation dialog box.

1. Choose Pick points button
2. Select internal point : pick (E)

Command : AA (enter)  
 Specify first corner point or [Object/Add/Subtract] : O  
 Select objects : pick boundary (F)  
 Area = 16.6618, Perimeter = 19.2712

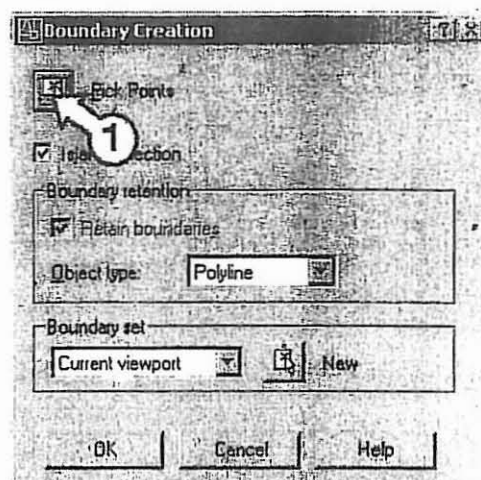
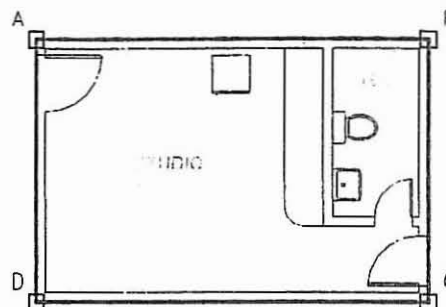
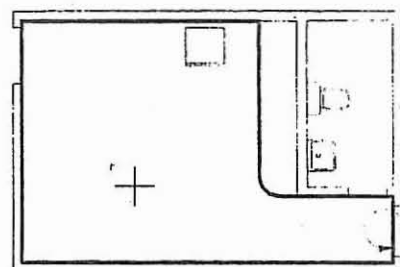


fig. VIII-19. Showing Boundary Creation dialog box



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## 5. AREA using Add and Subtract

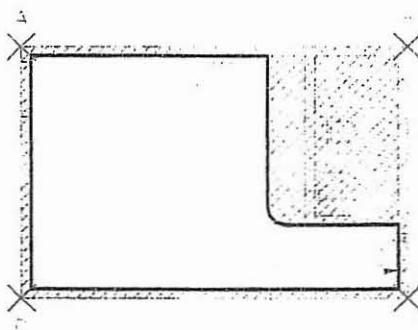


fig. VIII-20. Showing STUDIO with existing boundary

Command : AREA (enter)

Specify first corner point or [Object/Add/Subtract]

: A (enter)

Specify first corner point or [Object/Subtract]

: pick INT of (A)Specify next corner point or press ENTER for total (ADD mode): pick INT of (B)Specify next corner point or press ENTER for total (ADD mode): pick INT of (C)Specify next corner point or press ENTER for total (ADD mode): pick INT of (D)

Specify next corner point or press ENTER for total (ADD mode) : (enter)

Area = 25.5225, Perimeter = 20.6000

Total area = 25.5225

Specify first corner point or [Object/Subtract]

: S (enter)

Specify first corner point or [Object/Subtract]

: O (enter)

((SUBTRACT mode) Select objects

: pick line (E)

Area = 16.6618, Perimeter = 19.2712

Total area = 8.8607

(SUBTRACT mode) Select objects

: (enter)

Specify first corner point or [Object/Add]

: (enter)



Defines the object type, boundary set, and island detection method for defining boundaries from points you specify. The Boundary Creation dialog box is a limited version of the Boundary Hatch dialog box.



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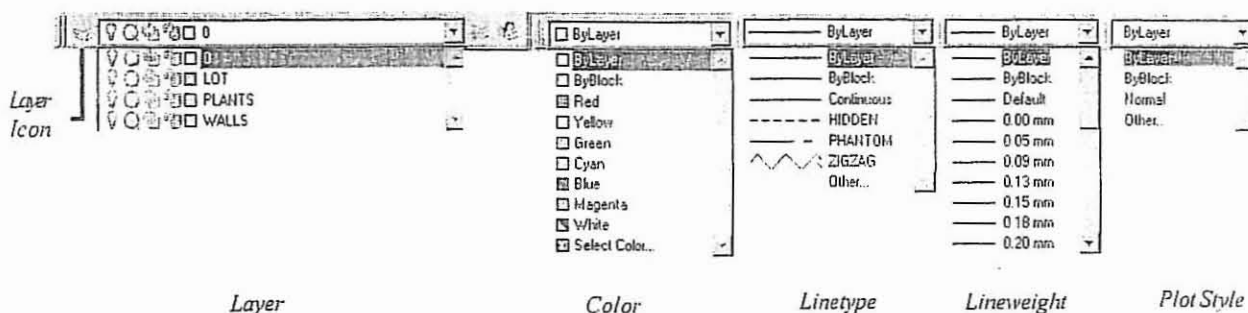
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## LAYERS, COLORS, LINETYPES, LINEWEIGHT, PLOT STYLE CONTROL

## Layers

An electronic overlay similar to an acetate. Every layer has an associated color and linetype. Layers are the equivalent of the overlays used in paper-based drafting. They are the primary organizational tool in AutoCAD.



## A: ADVANTAGES OF LAYERS

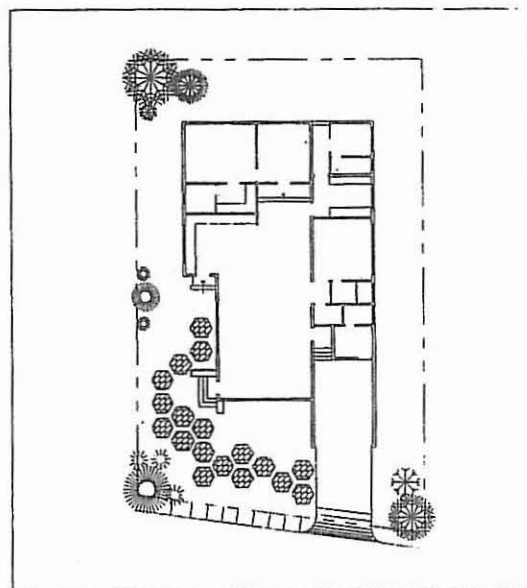
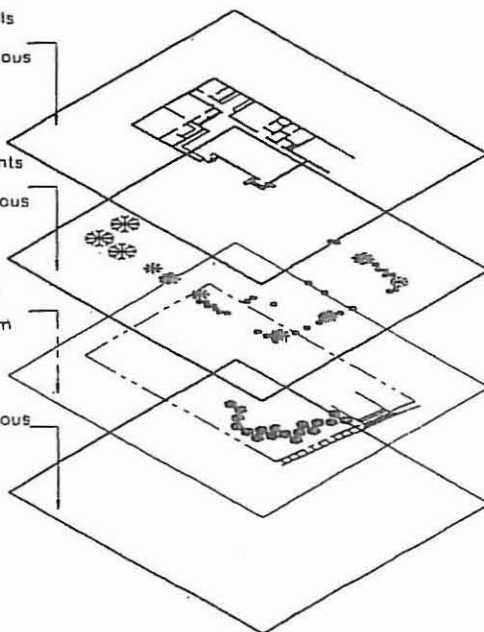
- Easy selecting
- Selective printing
- Control of regeneration
- Easy editing

Layer Name = Walls  
Color = Cyan  
Linetype = Continuous

Layer Name = Plants  
Color = Green  
Linetype = Continuous

Layer Name = Lot  
Color = Magenta  
Linetype = Phantom

Layer Name = 0  
Color = White  
Linetype = Continuous  
(DEFAULT LAYER)



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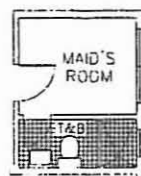
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**B: CAPABILITIES OF LAYERS**

-  **OFF** - Objects in layer turned-OFF are invisible onscreen or in plotting, but included in REGENeration. Use ON to restore visibility.
-  **FREEZE** - Same effect using OFF, does not display, plot, or regenerate objects on frozen layers but it will speed up ZOOM, PAN, and other display commands; improve object selection performance; and reduce regeneration time for complex drawings. Use THAW to restore frozen layers.
-  **LOCK** - You cannot edit the objects on a locked layer; however, they are still visible if the layer is on and thawed. You can make a locked layer current and you can add objects to it. Use UNLOCK to restore
-  **Plot / No Plot** - Prevents the selected layers from being plotted. It can be useful to turn off plotting for a layer that contains reference information. You can view the reference information while you work.



all layers are ON

some layers turned  
OFF/FREEZEall layers are OFF/FREEZE  
except walls

fig. IX-1. Controlling objects

**C: COLOR METHOD**

- BYBLOCK - objects inherit the color of destination layer or can change the color of the block through PROPERTIES palette or toolbar
- BYLAYER - objects inherit color of destination layer.

**D: LINETYPE METHOD**

- BYBLOCK - objects inherit the linetype of destination layer or assigns linetype to objects using PROPERTIES palette or toolbar
- BYLAYER - objects inherit linetype of destination layer.

**E: LINEWEIGHTS**

Add width to your objects. All objects can be displayed and plotted with lineweights except True Type® fonts, raster images, points, and solid fills (or 2D solids). AutoCAD provides a number of available lineweights, including DEFAULT, which is the default lineweight. The default value of DEFAULT is .01 inch or .25 mm. (This value is set by using the LWDEFAULT system variable or in the Lineweight Settings dialog box.)

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## F: CREATING LAYERS



Command : **LA** (enter)

Layer Properties Manager dialog box will appear in your screen

1. In the Layer Properties Manager, choose **New**.  
A new layer is displayed in the list with the temporary name **LAYER1**.
2. Enter a new name.

Example : **LOT**



To create more than one layer, choose **New** again, enter the new layer name, and press **ENTER**.

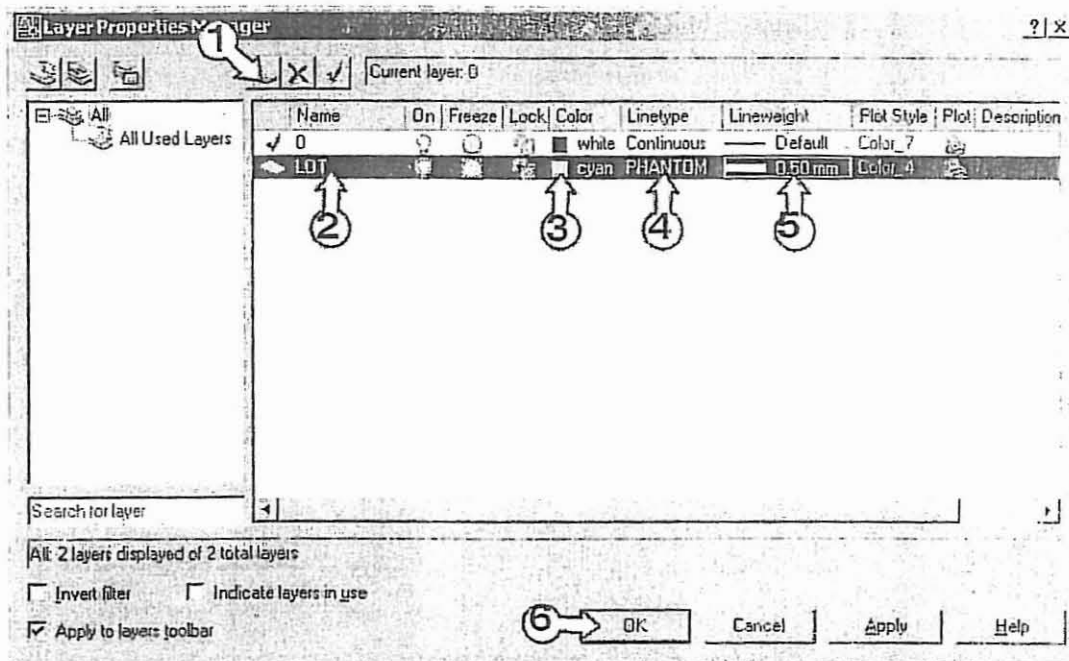


fig.IX-2. Showing Layer Properties Manager

To assign a color to a layer

3. In the Select Color dialog box, select a color name or enter a color number in the Color box.

To assign a linetype to a layer

4. In the Layer Properties Manager, select a layer and then click the linetype associated with that layer.
  - 4.1. If you do not see the linetype that you want, choose **Load** to load a linetype from a file

In the Linetype Manager, you can load additional linetypes.

- 4.2. Choose the linetype that you want and choose **OK**

To assign a lineweight to a layer

5. In the Lineweight dialog box, select a lineweight from the list.



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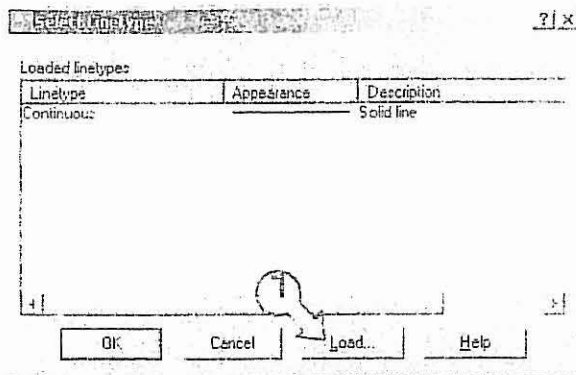


fig. IX-3. Showing Linetype Manager dialog box

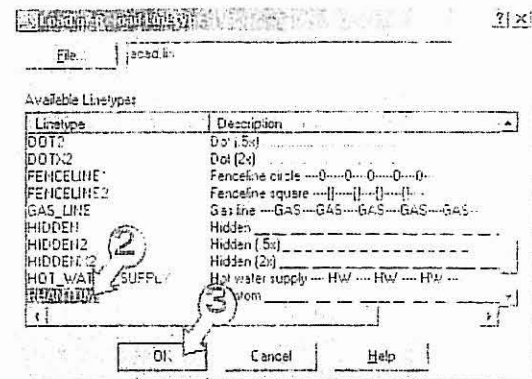
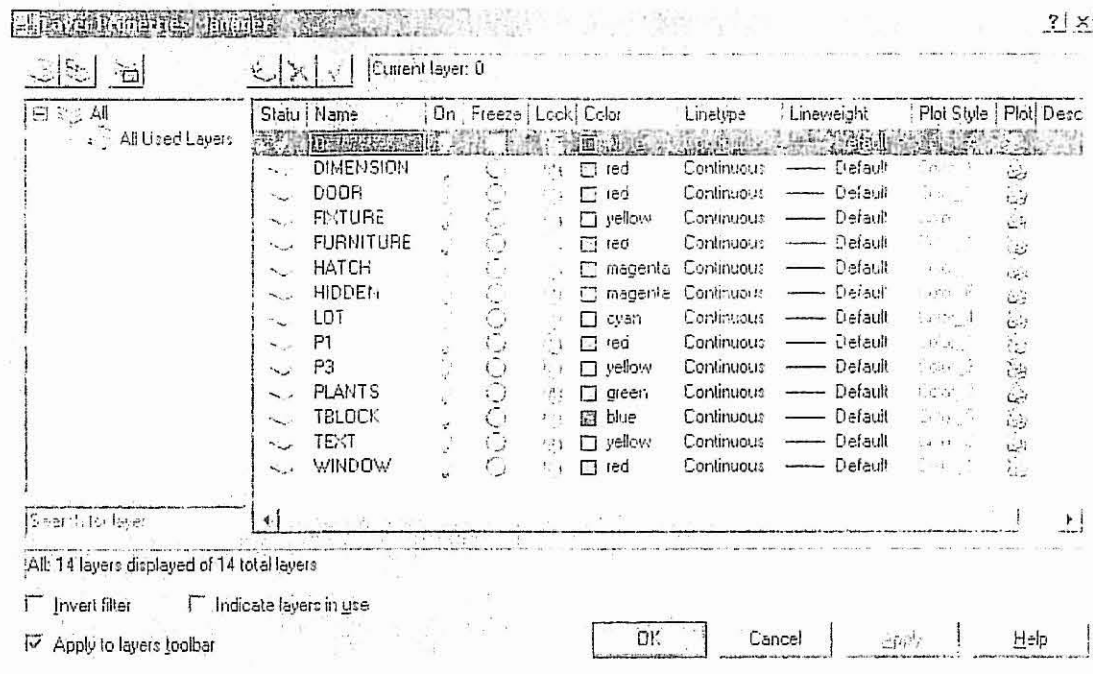


fig. IX-4. Showing Load or Reload Linetypes dialog box

Exer. # 1: Create the following layers

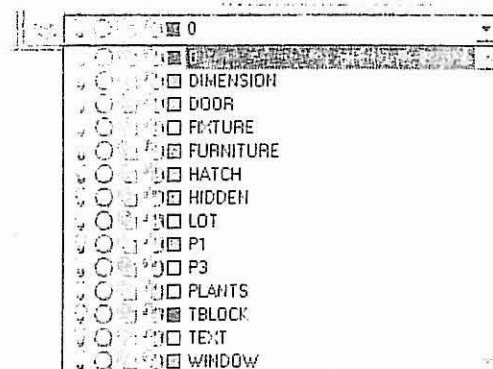


Exer. # 2: Assigning current layer

1. In the Property Toolbar, choose Layer Control
2. In the Layer Control select a layer name



SEE special lesson 158  
about layer filters



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## COMMAND TO SET THE LINETYPE SCALE FACTOR

1. PROPERTIES - (SEE PAGE 43)
2. LTSCALE - Sets the global linetype scale factor (cannot be equal to zero).

Exer. # 3: Use LTSCALE to change the relative length of linetypes per drawing unit.

Command : **LTSCALE**

Enter new linetype scale factor <1.0000> : 0.5

```

----- LTSCALE = 1.00
----- LTSCALE = 0.50
----- LTSCALE = 0.25
  
```

## MATCHPROP

Copies the properties from one object to one or more objects.

You can copy some or all properties of one object to one or more objects using MATCHPROP. Properties that can be copied include color, layer, linetype, linetype scale, linewidth, thickness, plot style, and in some cases, dimension, text, and hatch. The following table lists the properties you can copy for each AutoCAD object.

Object properties you can change with Match Properties

| Object      | Color & layer | Line-type | Line-weight | Thick-ness | Text | Dimen-sion | Hatch | Plot style |
|-------------|---------------|-----------|-------------|------------|------|------------|-------|------------|
| 3D face     | x             | x         | x           |            |      |            |       | x          |
| Arc         | x             | x         | x           | x          |      |            |       | x          |
| Attdef      | x             |           |             | x          | x    |            |       | x          |
| Body        | x             | x         | x           |            |      |            |       | x          |
| Circle      | x             | x         | x           | x          |      |            |       | x          |
| Dimension   | x             | x         |             |            |      | x          |       | x          |
| Ellipse     | x             | x         | x           |            |      |            |       | x          |
| Hatch       | x             |           | x           |            |      |            | x     | x          |
| Image       | x             | x         |             |            |      |            |       | x          |
| Insert      | x             | x         | x           |            |      |            |       | x          |
| Leader      | x             | x         | x           |            |      | x          |       | x          |
| Line        | x             | x         | x           | x          |      |            |       | x          |
| Mtext       | x             |           |             |            | x    |            |       | x          |
| OLE object  |               |           |             |            |      |            |       |            |
| Point       | x             |           | x           | x          |      |            |       | x          |
| 2D polyline | x             | x         | x           | x          |      |            |       | x          |
| 3D polyline | x             | x         | x           |            |      |            |       | x          |
| 3D mesh     | x             | x         | x           |            |      |            |       | x          |
| Pface mesh  | x             | x         | x           |            |      |            |       | x          |
| Ray         | x             | x         | x           |            |      |            |       | x          |
| Region      | x             | x         | x           | x          |      |            |       | x          |
| 2D solid    | x             | x         | x           |            |      |            |       | x          |
| ACIS solid  | x             | x         | x           |            |      |            |       | x          |
| Spline      | x             | x         | x           |            |      |            |       | x          |
| Text        | x             | x         |             | x          | x    |            |       | x          |
| Tolerance   | x             | x         | x           |            |      | x          |       | x          |
| Trace       | x             | x         | x           | x          |      |            |       | x          |
| Viewport    | x             |           | x           |            |      |            |       | x          |
| Xline       | x             | x         | x           |            |      |            |       | x          |
| Xref        | x             | x         | x           |            |      |            |       | x          |
| Zombie      | x             | x         | x           |            |      |            |       | x          |



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AutoCAD

## QUICK SELECT

Use Quick Select to select objects based on object type or object properties.

Exer. #3: Changing layer using Properties window and Quick Select



Command: QSELECT (enter) / CH (enter)  
Properties window dialog box will appear on your screen

- 1 In the Properties window, choose Quick Select.
- 2 In the Quick Select dialog box under Apply to, select Entire Drawing.
- 3 Under Object Type, select Line
- 4 Under Properties, select Layer
- 5 Under Operator, select Equals
- 6 Under Value, select 0
- 7 Under How to Apply, select Include in New Selection Set.
- 8 Choose OK.

AutoCAD selects all lines in the drawing under Layer 0 and closes the Quick Select dialog box.

- 9 Change the property value in a dialog box
- 10 Press esc (twice)

Apply to: Entire drawing (2)

Object type: Line (3)

Properties: Color (4)

Operator: = Equals (5)

Value: 0 (6)

How to apply: Include in new selection set (7)

Append to current selection set (8)

OK Cancel Help



CHANGE or CHPROP commands may be used to modify layer properties

Line (0)

Color: ByLayer

Layer: 0

Linetype: ByLayer

Linetype scale: 1.0000

Plot style: ByColor

Lineweight: ByLayer

Hyperlink: 0.0000

Thickness: 0.0000

Start X: VARIES

Start Y: VARIES

Start Z: 0.0000

End X: VARIES

End Y: VARIES

End Z: 0.0000

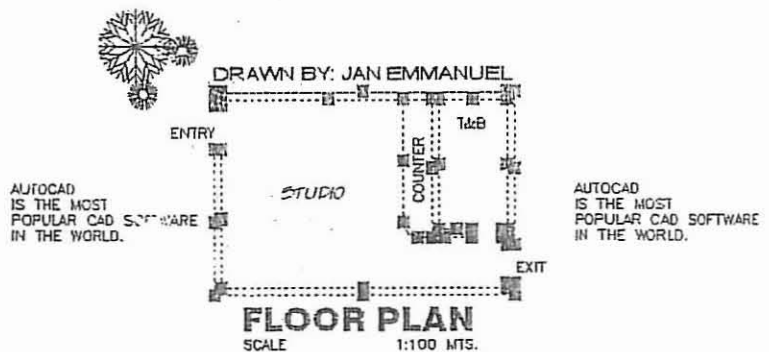
Defe X: VARIES

Defe Y: VARIES

Defe Z: 0.0000

Length: VARIES

Angle: VARIES



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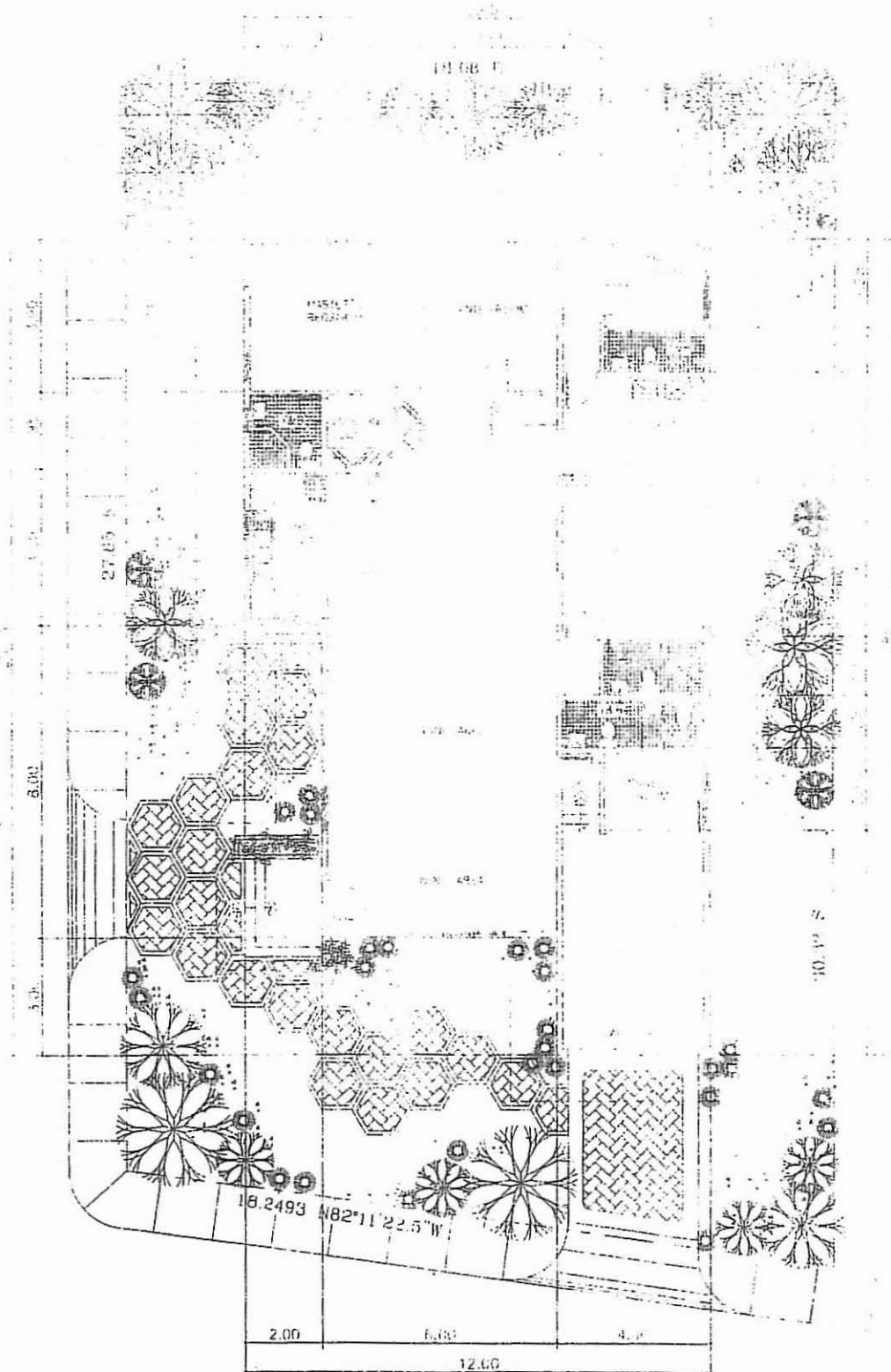
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**AutoCAD**

## THE MULTIPLE DOCUMENT ENVIRONMENT

Multiple Document Environment allows the transfers of data, objects, properties, and custom objects, among drawings.

Use the Multiple Document Environment to:

1. Drag and drop objects in the active drawings. The objects can be either copied or moved.



*You can open drawings by dropping them from Explorer into your AutoCAD session.*

2. Paint object properties such as color, layer, or linetype from one drawing to another.
3. Cut/copy and paste drawing objects from one drawing to another. This is more accurate than drag and drop with the options of specifying a base point or the original coordinates.



*Use Right click menu to access the Cut/Copy and Paste options.*

4. Switch between single drawing sessions without cancelling the current command.

**Single Document Interface (SDI)** - If the SDI system variable is set to 1, then you can open only one drawing per session. The default value for SDI is 0

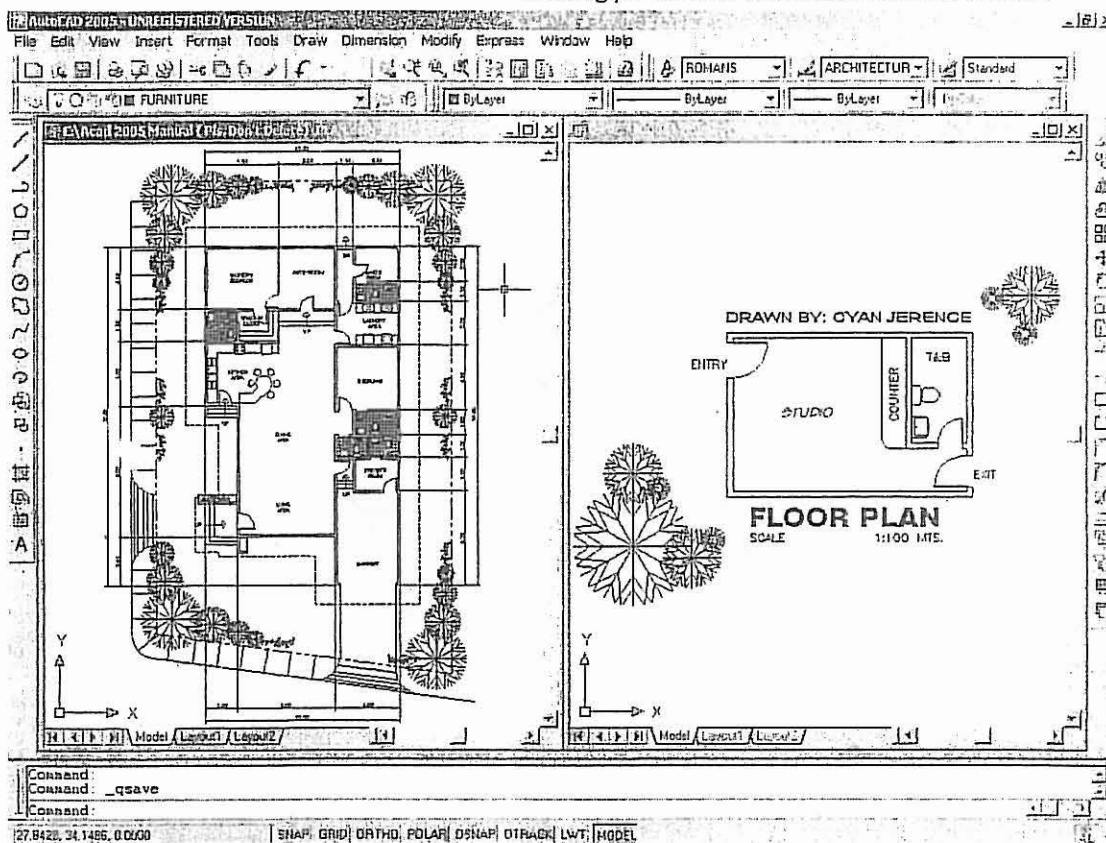


fig. IX-5. Showing Multiple Document Environment



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## DIMENSIONING

Dimensioning is the process of adding measurement annotation to a drawing. AutoCAD provides many ways to format dimensions. You can create dimensions for a wide variety of object shapes in many different orientations. You can create dimension styles to format dimensions in your drawing conform to industry or project standard.



fig.X-1. Show Dimension toolbar

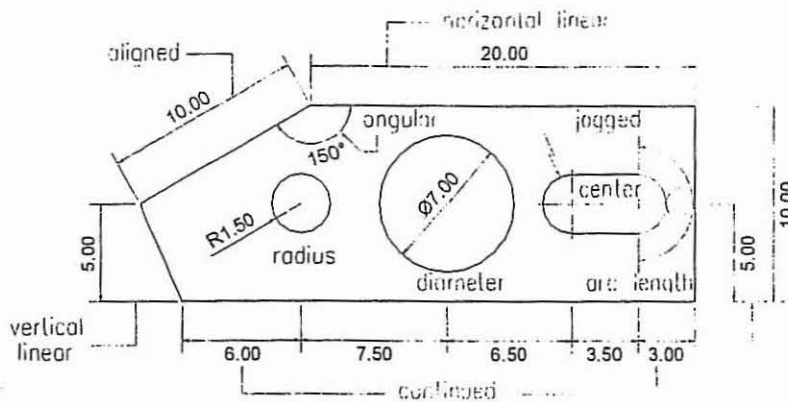


fig.X-2. Show example of Dimension

### AutoCAD DIMENSION AND METHOD

| MENU       | TOOLBAR BUTTON | COMMAND     | DESCRIPTION                                                                                                                                                     |
|------------|----------------|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Linear     |                | DIMLINEAR   | Measures a straight-line distance. Includes options to create horizontal, vertical, or rotated linear dimension.                                                |
| Aligned    |                | DIMALIGNED  | Creates a linear dimension with the dimension line parallel to the extension line origin points. The dimension creates a true-length measurement of the object. |
| Ordinate   |                | DIMORDINATE | Creates a dimension showing a point's X or Y ordinate measured from a given origin point.                                                                       |
| Radius     |                | DIMRADIUS   | Measures the radius of circles and arcs.                                                                                                                        |
| Diameter   |                | DIMDIAMETER | Measures the diameter of circles and arcs.                                                                                                                      |
| Angular    |                | DIMANGULAR  | Measures angles.                                                                                                                                                |
| Arc Length |                | DIMARC      | Creates arc length dimension.                                                                                                                                   |
| Jogged     |                | DIMJOGGED   | Measures the radius of the selected object and displays the dimension text with a radius symbol in front of it                                                  |



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| MENU      | TOOLBAR<br>BUTTON | COMMAND   | DESCRIPTION                                                                                                |
|-----------|-------------------|-----------|------------------------------------------------------------------------------------------------------------|
| Baseline  |                   | BASLINE   | Creates a dimension line parallel to the object being dimensioned.                                         |
| Continue  |                   | CONTINUE  | Creates a dimension line parallel to the object being dimensioned, continuing from the previous dimension. |
| Leader    |                   | LEADER    | Creates a dimension line with a leader line pointing to the dimensioned object.                            |
| Tolerance |                   | TOLERANCE | Creates a dimension line with a tolerance value.                                                           |
| Dim Style |                   | DIMSTYLE  | Creates a dimension line with a specific style.                                                            |
| Dim Text  |                   | DIMTEXT   | Creates a dimension line with a specific text.                                                             |

## 1. Creating Circle Dimension

- Command : DRA(enter) R: 0.00  
 Specify arc or circle : pick circle  
 Enter dimension text <1.5000> : press enter  
 Specify dimension line location or [Mtext/Text/Angle]: pick at any point

## 2. DIAMETER

- Command : DDI(enter) Ø2.000  
 Select arc or circle : pick circle  
 Enter dimension text <2.000> : press enter  
 Specify dimension line location or [Mtext/Text/Angle]: pick at any point

## 3. ARC LENGTH

- Command : DAR(enter)  
 Select arc or polyline arc segment: pick the arc  
 Specify arc length dimension location, or [Mtext/Text/Angle/Partial/Leader]: pick any point

## 4. JOGGED

- Command : DJO(enter)  
 Select arc or circle: pick the arc  
 Specify center location override: pick at any pt  
 Specify dimension line location or [Mtext/Text/Angle]: pick at any pt  
 Specify jog location: pick at any pt

## 5. CENTER

- Command : DCE (enter)  
 Select arc or circle : pick circle 3

DIMCEN = 0.09

DIMCEN = -0.09



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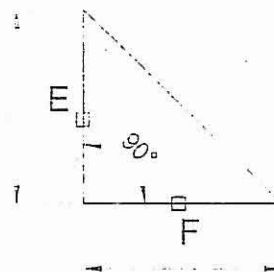
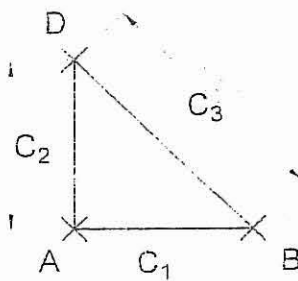
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**AutoCAD**





Exer. # 2: Creating Linear Dimensions

1 HORIZONTAL

Command : DLI (enter)  
 Specify first extension line origin or <select object> : INT of (A)  
 Specify second extension line origin : INT of (B)  
 Specify dimension line location or [Mtext/Text/Angle] : pick at any point (C<sub>1</sub>)  
 Dimension text = 3.000

2 VERTICAL

Command : DLI (enter)  
 Specify first extension line origin or <select object> : INT of (A)  
 Specify second extension line origin : INT of (D)  
 Specify dimension line location or [Mtext/Text/Angle] : pick at any point (C<sub>2</sub>)  
 Dimension text = 3.000

3 ALIGN

Command : DAL (enter)  
 Specify first extension line origin or <select object> : INT of (D)  
 Specify second extension line origin : INT of (B)  
 Specify dimension line location or [Mtext/Text/Angle] : pick at any point (C<sub>3</sub>)  
 Dimension text = 4.2426

Exer. # 3: Others

1 ANGULAR

Command : DAN (enter)  
 Select arc, circle, line, or <specify vertex> : pick line (E)  
 Select second line : pick line (F)  
 Specify dimension arc line location or [Mtext/Text/Angle] : pick at any point  
 Dimension text = 90



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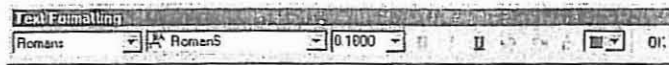
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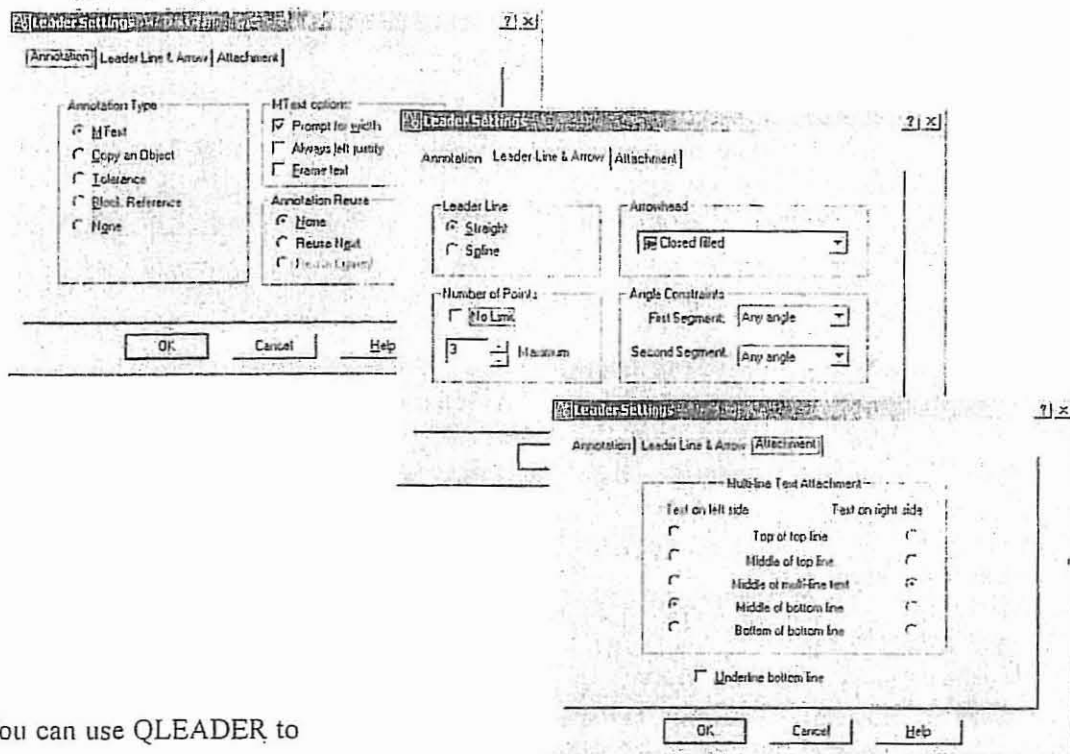
Exer. # 4: Using Leader at command prompt

 $\frac{1}{4}$ " MARINE PLYWOOD  
ON 2"x2" WOOD NAILERS**2 LEADER**

- Command : **LE (enter)**  
 Specify first leader point, or [Settings]<Settings>: **pick start point**  
 Specify next point : **pick next point**  
 Specify next point : **pick next point**  
 Specify text width <0.0000> : **press enter**  
 Enter first line of annotation text <Mtext> : **press enter**



Use QLEADER to quickly create leaders and leader annotations. You can use the Leader Settings dialog box to customize the command so that it prompts you for the number of leader points and the annotation type suited to your drawing needs.



You can use QLEADER to

1. Specify leader annotation and annotation format
2. Set the location where leaders attach to multiline text annotation
3. Limit the number of leader points
4. Constrain the angle of the first and second leader segments

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**AutoCAD**

## Exer. #4: Creating Continue and Baseline Dimension

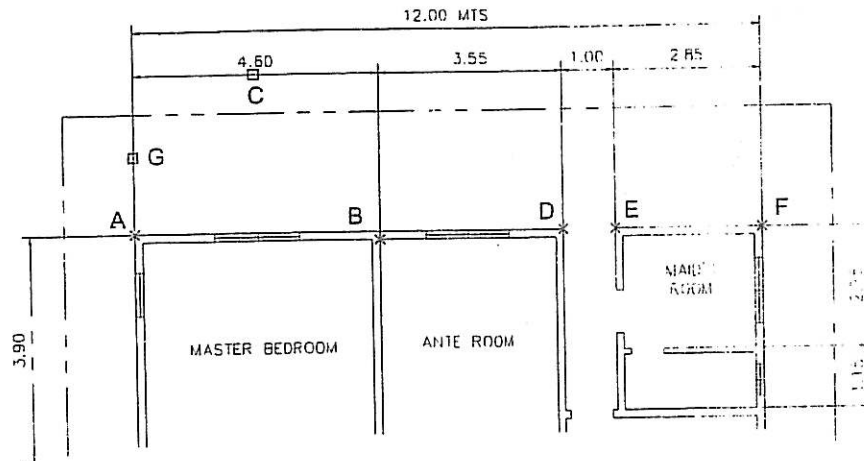


fig. X-3. Showing Continue and Baseline Dimension

## 1. LINEAR DIMENSION

- Command : DLI (enter)  
 Specify first extension line origin or <select object> : INT of (A)  
 Specify second extension line origin : INT of (B)  
 Specify dimension line location or [T/DT/A/H/V/R] : pick point (C)

## 2. CONTINUE DIMENSION

- Command : DCO (enter)  
 Specify a second extension line origin or [Undo/Select] <Select> : INT of (D)  
 Specify a second extension line origin or [Undo/Select] <Select> : INT of (E)  
 Specify a second extension line origin or [Undo/Select] <Select> : INT of (F)  
 Specify a second extension line origin or [Undo/Select] <Select> : press enter  
 Select continued dimension : press enter

## 3. BASELINE DIMENSION

- Command : DIMDLI (enter)  
 Enter new value for DIMDLI <0.3800> : 0.75

- Command : DBA (enter)  
 Specify a second extension line origin or [Select] <Select> : press enter  
 Select base dimension : pick extension line (G)  
 Specify a second extension line origin or [Select] <Select> : INT of (F)  
 Enter dimension text <12.0000> : press enter



You may use QDIM commands instead of DimLinears and DimContinue



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## DIMENSION COMMANDS AND VARIABLES

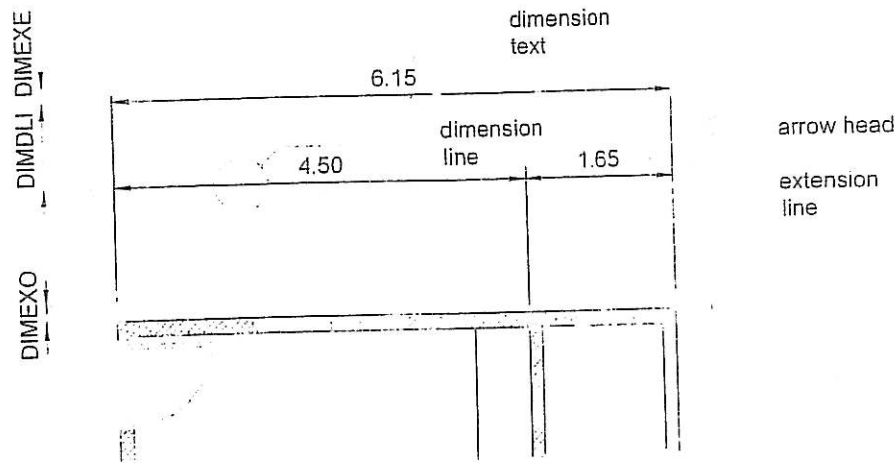


fig. X-4. Showing dimension variables

### A: EDITING DIMENSIONS

1. **DIM. VARIABLES-** A set of numeric values, text strings, and settings that control Autocad dimension features associates with DDIM.
2. **STATUS** - To list all dimension variables and their current status.
3. **DDIM** - A dimension style is a named group of dimension settings that determines the appearance of the dimension. By creating styles, you can quickly and easily set all relevant dimensioning system variables and control the layout and appearance of any dimension. You can also create and modify dimension styles through an easy-to-use set of dialog boxes with the DDIM command.
4. **DIMEDIT** - affects dimension text and extension lines on one or more dimension objects
  - HOME - Moves rotated dimension text back to its default position.
  - NEW - Changes dimension text using the Multiline Text Editor.
  - ROTATE - Rotates dimension text. This option is similar to the Angle option of DIMTEDIT.
  - OBLIQUE - Adjusts the oblique angle of the extension lines for linear dimensions. AutoCAD creates linear dimensions with extension lines perpendicular to the direction of the dimension line. The Oblique option is useful when extension lines conflict with other features of the drawing.
5. **DIMENSION TEXT EDIT-** Moves and rotates dimension text
6. **DIMENSION UPDATE** - Updates dimension objects with the current settings of the dimension style and units.

### B: CONTROLLING DIMENSION TEXT( Color, Height, Style, Units and Orientation)

- Assigning colors
  1. **DIMCLRT** - color of dimension text.
  2. **DIMCLRDL** - color of dimension line and leader.
  3. **DIMCLRE** - color of extension lines



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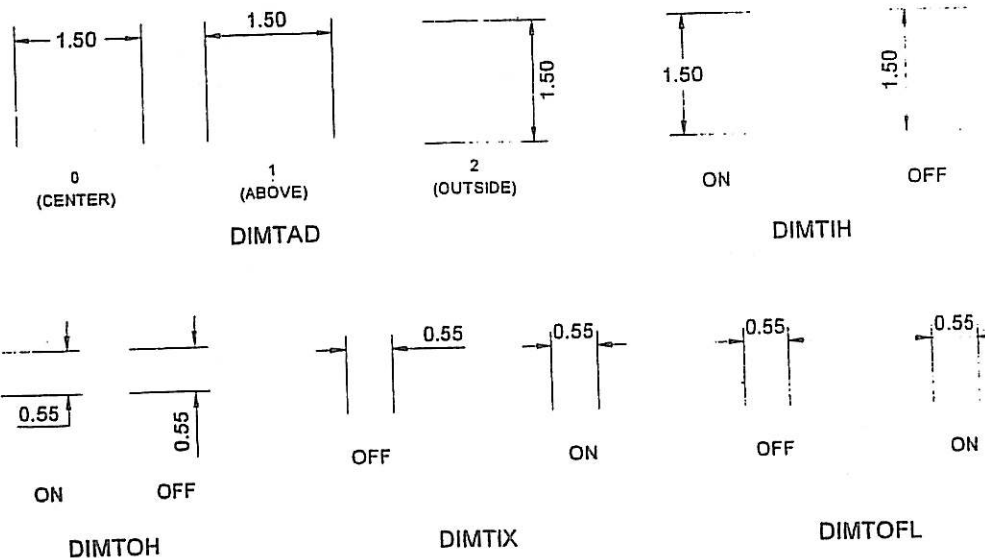


## C: CONTROLLING HEIGHT, DECIMAL PLACES, SCALE AND TEXT STYLE

1. DIMTXT - dimension text height
2. DIMASZ - dimension arrow size
3. DIMTXSTY - dimension text style
4. DIMDEC - number of decimal places
5. DIMSCALE - overall scale factor
6. DIMLFAC - linear unit scale factor

## D: CONTROLLING TEXT ORIENTATION AND FORMAT

1. DIMTAD - text above dimension line
2. DIMTIH - text inside extension line is horizontal (*for vertical dim. only*).
3. DIMTOH - text outside extension line is horizontal (*for vertical dim. only*).
4. DIMITX - forces text inside extension lines
5. DIMTOFL - forces line inside extension lines



## E: CONTROLLING DIMENSION LINE OFFSETS

1. DIMEXO - extension line origin/offset
2. DIMEXE - extension line extend.
3. DIMDLI - dimension line increment
4. DIMDLE - dimension line extend
5. DIMGAP - gap from dimension line to text



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## DIMENSION STYLES

Dimension styles control a dimension's format and appearance. They help you establish and enforce drafting standards for drawings and make changes to dimension formats and behavior easier to implement. A dimension style defines

- The format and position of dimension lines, extension lines, arrowheads, and center marks
- The appearance, position, and behavior of dimension text
- The rules governing where AutoCAD places text and dimension lines
- The overall dimension scale
- The format and precision of primary, alternate, and angular dimension units
- The format and precision of tolerance values

### To create a dimension style

#### \* Dimension Variables

- DIMASO = ON

#### Lines and Arrows

- Baseline spacing = 0.75 = DIMDLI

- Arrowheads = (arrow style) = DIMBLK

- Arrow size = 0.15 = DIMASZ

#### Text

- Text style = Romans = DIMTXSTY

- Text color = Yellow = DIMCLRT

- Text height = 0.20 = DIMTXT

- Text Placement = Vertical (Above) = DIMITAD (1)

- Text Alignment = Aligned with dim line = DIMITX and DIMITOH (ON)

#### Fit

- Fit Options = Always keep text between ext lines = DIMITX (ON)

- Fine Tuning = Always draw dim line between ext lines = DIMITOFL (ON)

#### Primary Units

- Precision = 0.00 = DIMDEC (2)



Command : D (enter)



The Dimension Style Manager is displayed. In addition to creating new styles, you can perform many style management tasks.

1. In the Dimension Style Manager, choose New.
2. In the New Dimension Style dialog box, enter the new style name.  
eg. : ARCHITECTURAL
3. Select the style you want to use as a start point for the new style.  
If you have not created styles, you start with STANDARD. The starting style and the new style are not linked.
4. Indicate the dimension type for which you want to use the new style.
5. Choose Continue.



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6. In the New Dimension Style dialog box, choose any of the following tabs to enter dimension settings for the new style:

**Lines and Arrows**

Sets the appearance and behavior of the dimension lines, extension lines, arrowheads, center marks, and centerlines.

**Text**

Sets the dimension text appearance, placement, alignment, and movement.

**Fit**

Sets options governing where AutoCAD places dimension lines, extension lines, and text. Also defines the overall dimension scale.

**Primary Units**

Sets the format and precision of linear and angular dimension units

**Alternate Units**

Sets the alternate unit format and precision

**Tolerances**

Sets lateral tolerance values and precision

7. When you finish making changes on the tabs of the New Dimension Style dialog box, choose **OK**, and then **close** the Dimension Style Manager.

## EDITING DIMENSION PROPERTIES

### To edit dimension properties

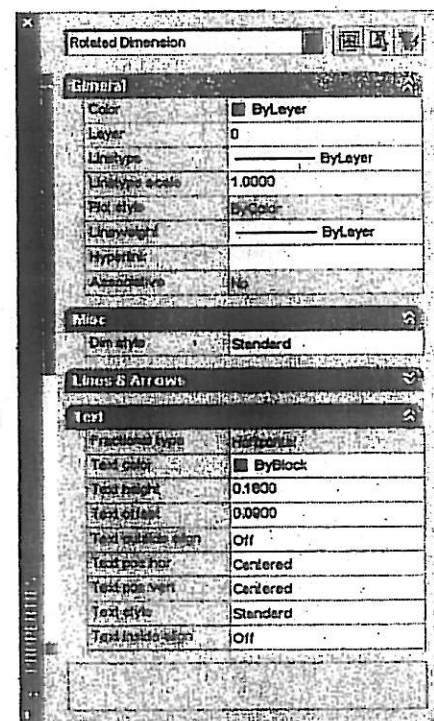
- 1 Select the dimension whose properties you want to edit.
- 2 From the Modify menu, select Properties.
- 3 In the Properties window, change settings as needed.



Shortcut menu Select a dimension, right-click in the drawing area, then choose Properties.

### To save modified dimension properties to a new style

- 1 Select the modified dimension(s), and then right-click.
- 2 From the shortcut menu, choose Dim Style SaveAs New Style.
- 3 In the New Dimension Style dialog box, enter the new style name, and then choose OK.



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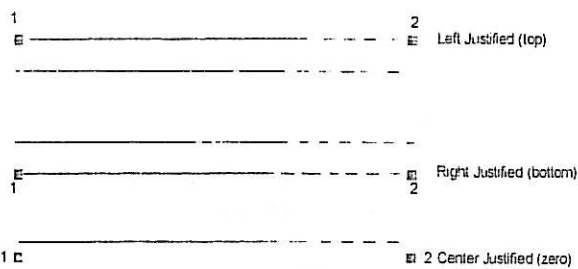
## CREATING MULTI-LINES

- MLINE** - Multiple parallel lines are called multilines. Multilines comprise up to 16 lines.
- MLSTYLE** - controls the number of elements and the properties of each element.
- MLEDIT** - controls intersections between multilines with the Multiline Edit Tools dialog box.

Exer. # 1: Creating Mline

## Setting Mline Justification

- Justification** - determines the dragline location
- Scale** - controls the overall width of the multiline
- Style** - specifies the style to use for mline

Command : **MLINE** (enter)

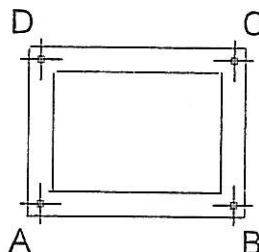
Current settings: Justification = Top, Scale = 1.00, Style = STANDARD

Specify start point or [Justification/Scale/Style] : **J** (enter)Enter justification type [Top/Zero/Bottom] <top> : **Z** (enter)

Current settings: Justification = Zero, Scale = 1.00, Style = STANDARD

Specify start point or [Justification/Scale/Style] : **S** (enter)Enter mline scale <1.00> : **0.50** (enter)

Current settings: Justification = Zero, Scale = 0.50, Style = STANDARD

Specify start point or [Justification/Scale/Style] : **pick pt. (A)** (enter)Specify next point : **pick pt. (B)** (enter)Specify next point or [Undo] : **pick pt. (C)** (enter)Specify next point or [Close/Undo] : **pick pt. (D)** (enter)Specify next point or [Close/Undo] : **C** (enter)

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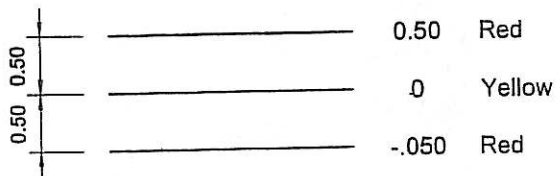


## Exer. # 2: Creating Mlstyle



You can create named styles for multilines to control the number of elements and the properties of each element. The style also controls the background fill and the end cap.

## A: TO CREATE A MULTILINE STYLE



Command : **MLSTYLE** (enter)

In the Multiline Styles dialog box

1. Click **New...** button
2. Type a name (eg. : **WINDOW**)
3. Click **Continue** button



Descriptions are optional and can be up to 255 characters, including spaces.

3. In the Description box, type a description
4. Choose **Add** to add another line
5. Highlight the element in the list
6. Then make changes to Offset, Color, and Linetype.
7. Choose **OK** when done
8. Choose **Save** to save the style

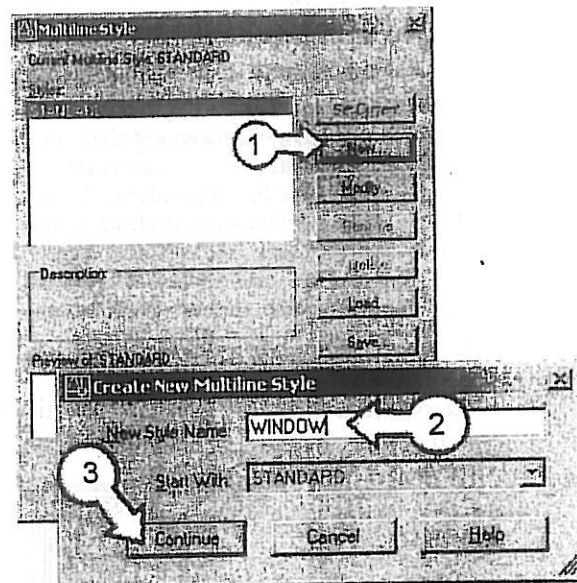


fig. X-3. Showing Multiline Styles dialog box

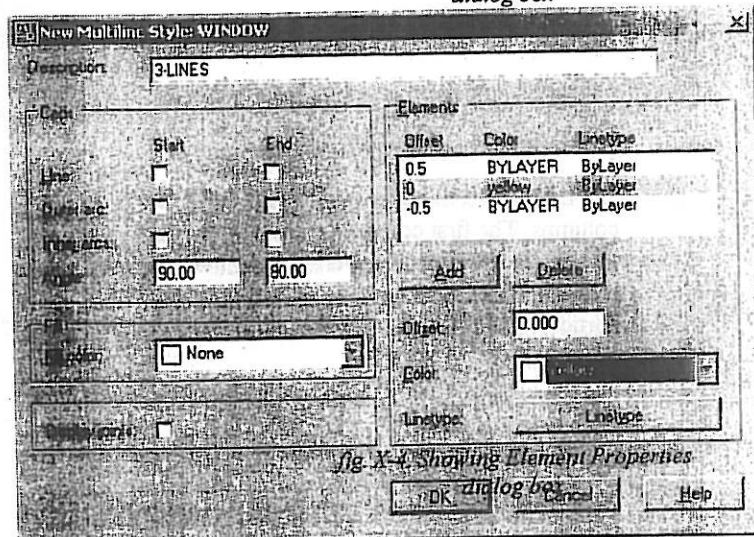


fig. X-4. Showing Element Properties dialog box



If you create more than one multiline style, save the current style before creating a new one or you lose the changes to the first style.

You can add up to 16 elements to a multiline style. If you create or modify an element so that it has a negative offset, it appears below the origin in the image tile of the Multiline Styles dialog box.



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## B: TO SPECIFY THE PROPERTIES OF THE ENTIRE MULTILINE

In the Multiline Style dialog box

10. Under **Caps**

select a line or an arc for each end of the multiline

Lines cross the end of the whole multiline, and outer arcs join the ends of the outermost elements. Inner arcs connect pairs of elements, leaving the centerline unconnected if there is an odd number of elements. For example, if there are six elements, inner arcs connect elements 2 and 5 and elements 3 and 4. If there are seven elements, inner arcs connect elements 2 and 6 and elements 3 and 5; element 4 is left unconnected.

11. Under **Fill**, choose the color

12. Choose **OK** to return to the Multiline Styles dialog

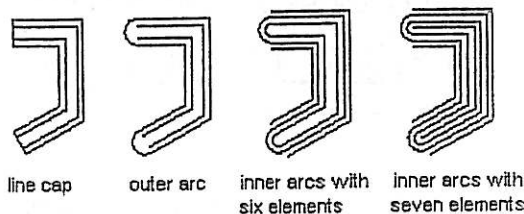


fig. 4 showing different results of start and end

Exer. # 3: Creates and modifies multiline patterns

Command : **MLEDIT (enter)**

The dialog box displays sample images in four columns. The first column governs multilines that cross, the second governs multilines that form a tee, the third governs corner joints and vertices, and the fourth governs multilines to be cut or joined.

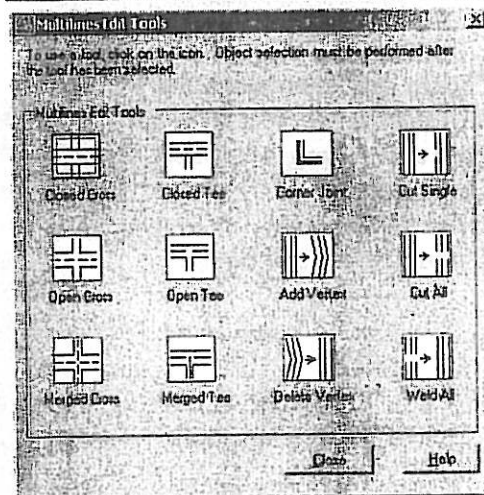
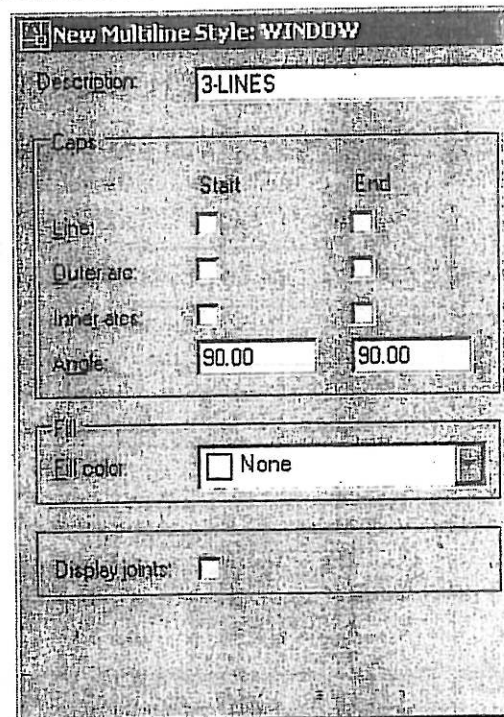
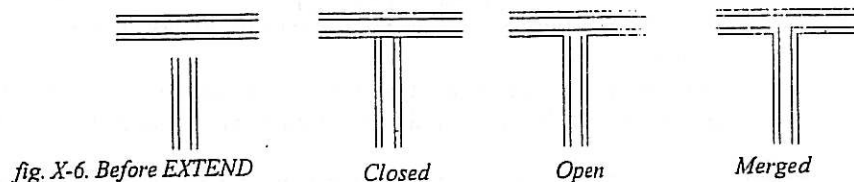


fig. X-5. Showing Multiline Edit Tools dialog box

Exer. # 4: Use **TRIM & EXTEND** to edit the multiline.



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## 3D MODELING

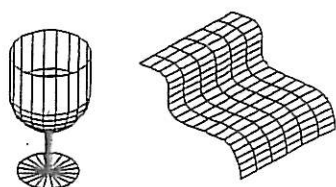


fig. XI-1. Surface model

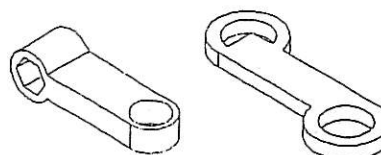
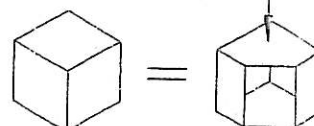


fig. XI-2. Solid model

## A: 3D SOLID MODEL &amp; 3D SURFACE MODEL

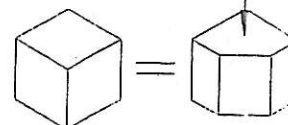
## 1: 3D SURFACE MODEL

- Compose of 3DFaces
- Usually hollow inside
- The drawing database is not mathematically complete
- Not suitable for boolean operations
- Small in file size

3D SURFACES  
HOLLOW COMPOSITON

## 2: 3D SOLID MODEL

- Solid inside
- Big in file size
- Suitable for Solid editing
- Candisplay massproperties  
(volume, centroid, radii of gyration, etc.)

3D SOLID  
SOLID INSIDE

## B: CONVERTING PRIMITIVES INTO A 3D MODEL

| OBJECTS                                              | 3D SURFACES | 3D SOLID |
|------------------------------------------------------|-------------|----------|
| 1 POINT                                              |             | N/A      |
| 2 LINEAR                                             |             |          |
| 3 FILLED OBJECTS<br>EX: TRAPEZOID                    |             |          |
| 4 BOUNDED OBJECTS<br>EX: RECTANG, POLYLINE, POLYGOON |             |          |
| 5 CIRCLE                                             |             |          |
| 6 ELLIPSE                                            |             |          |
| 7. DONUT                                             |             |          |
| 8 ARC                                                |             |          |
| 9 TEXT                                               | ACAD<br>    | N/A      |



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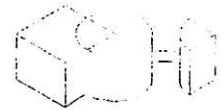
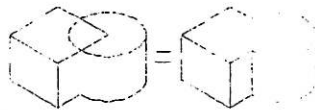
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C: SOLID EDITING FOR 3D SOLID MODELS ONLY



Union



Subtract

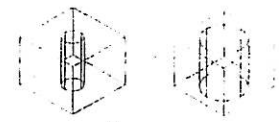
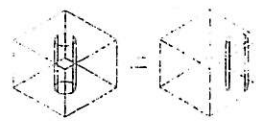
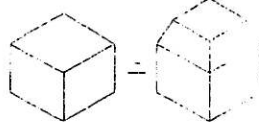
UNION

SUBTRACT

INTERSECT

Intersect

Extrude Faces



Move Faces

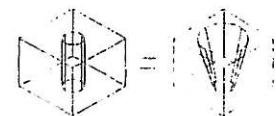
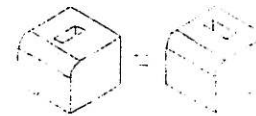
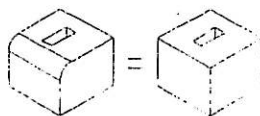
EXTRUDE FACE

MOVE FACE

OFFSET FACE

Offset Faces

Delete Face



Rotate Faces

Taper Faces

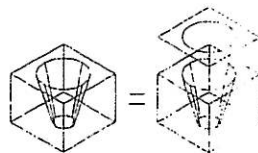
DELETE FACE

ROTATE FACE

TAPER FACE

Copy Faces

Color Faces



Copy Edge

COPY FACE

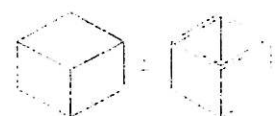
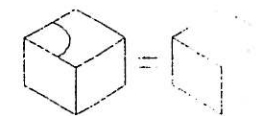
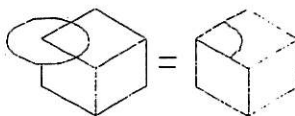
COLOR FACE

COPY EDGE  
COLOR EDGE

Color Edge

Imprint

Clean



Separate

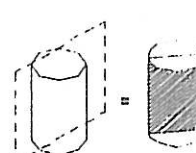
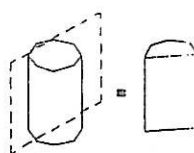
IMPRINT

CLEAN

SHELL

Shell

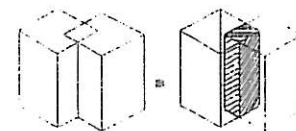
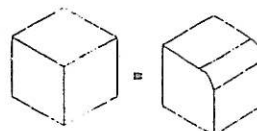
Check



SLICE

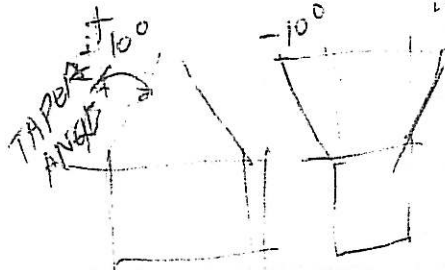
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CHAMFER



FILLET

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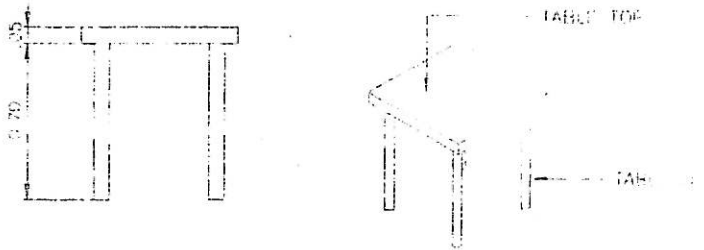
AutoCAD



## D: COMMAND TO CREATE / EDIT 3D OBJECTS

### 1: 3D SURFACE MODEL

**CHANGE** = command to change elevation and thickness  
**ELEVATION** = distance of object from the xy plane  
**THICKNESS** = extrusion height

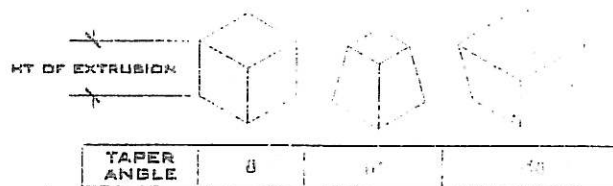


**TABLE TOP**  
 THICKNESS = 0.05  
 Elevation = 0.70  
**TABLE LEG**  
 Thickness = 0.70  
 Elevation = 0

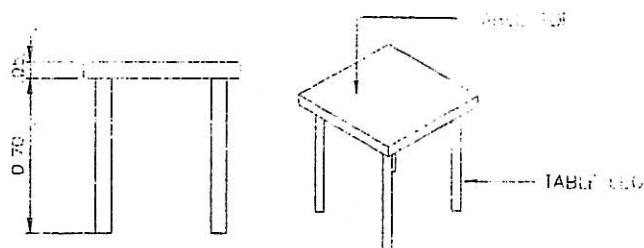
fig. XI-3. About Thickness & Elevation

### 2: 3D SOLID MODEL

**EXTRUDE** = command to assign thickness and taper angle  
**HEIGHT OF EXTRUSION** = thickness of the object



**MOVE** = command to assign distance from the xy plane



**TABLE TOP**  
 Height of extrusion = 0.05  
 Displacement = 0.70  
**TABLE LEG**  
 Height of extrusion = 0.70  
 Displacement = n/a

fig. XI-4 about thickness & displacement

Exer. # 1: Creating a 3D model using 3D Solid (3d side table)

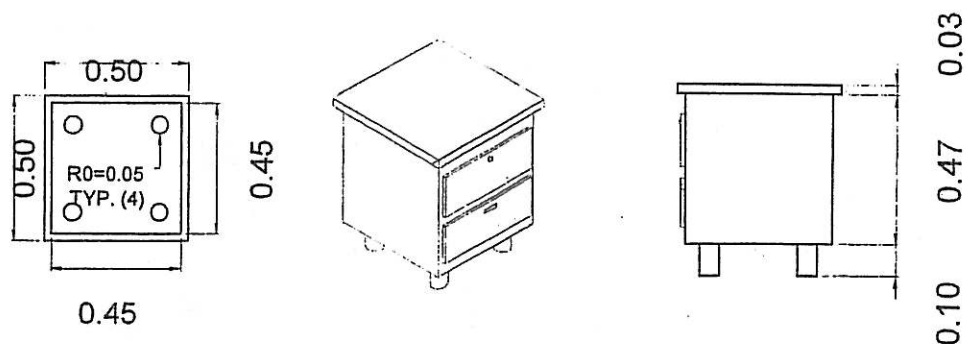


fig. XI-5. Creating 3dstab



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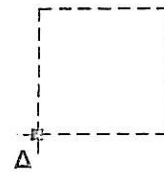
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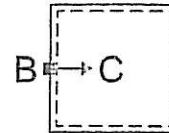
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## STEP 1. CREATING 2D MODEL

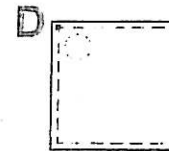
**A. Create Table top**  
**Command : REC** ↵  
 1<sup>st</sup> cor. pt [C/E/F/T/W] : **pick pt. (A)**  
 Other cor. pt. [A/D/R] : **@0.50,0.50** ↵



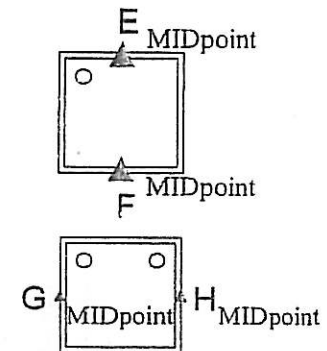
**B. Create Body**  
**Command : O** ↵  
 Offset distance <1.00> : **0.03** ↵  
 Select obj. <exit> : **pick (B)**  
 Side to offset : **pick (C)**



**C. Create Table legs**  
**Command : C** ↵  
 Center point [3P/2P/Ttr] : **FROM** ↵  
 Base point : **END (D)**  
 Offset : **@0.075, -0.075** ↵  
 Radius or [Diameter] : **0.025** ↵



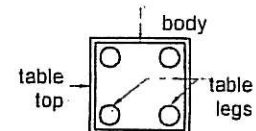
**Command : MI** ↵  
 Select objects : **L** ↵ (last ceated object)  
 Select objects : **L** ↵  
 First pt. of mirror line : **Mid of (E)**  
 Second point : **Mid of (F)**  
 Del. source objs.? [Y/N] <N> : ↵  
**Command : MI** ↵  
 Select objects : **L** ↵ (last selected object)  
 Select objects : **P** ↵ (previously selected obj.)  
 Select objects : **L** ↵  
 First pt. of mirror line : **Mid of (G)**  
 Second point : **Mid of (H)**  
 Del. source objs.? [Y/N] <N> : ↵



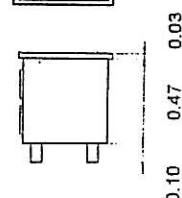
## STEP 2: CREATING 3D SOLID MODELS(using Extrude and Move)

|            | EXTRUDE             | MOVE         |
|------------|---------------------|--------------|
| Obj.       | Height of Extrusion | Displacement |
| TABLE TOP  | 0.03                | 0,0,0.57     |
| BODY       | 0.47                | 0,0,0.10     |
| TABLE LEGS | 0.10                | N/A          |

**Command: EXT (EXTRUDE)**  
 Select objects to extrude: (pick the object)  
 Select objects to extrude: ↵  
 Specify height of extrusion or [D/P/T]: **type the value**



**Command: M (Move)**  
 Select objects : (pick the object)  
 Select objects : ↵  
 Specify base pt or [Displacement]: **input x,y,z value**  
 Specify second pt or <use first pt as displacement> : ↵



You can also generate solid model by extruding a cross-section along a specified path.



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## E: VPOINT

Sets a viewing direction for a three-dimensional visualization of a drawing.

### 1. Setting a View with the Command line

Command: **VPOINT** (enter)

\*\*\* Switching to the WCS \*\*\*

Current view direction: . VIEWDIR=0.0000,-1.0000,0.0000

Specify a view point or [Rotate] <display compass and tripod>: **input a value of X, Y, Z**

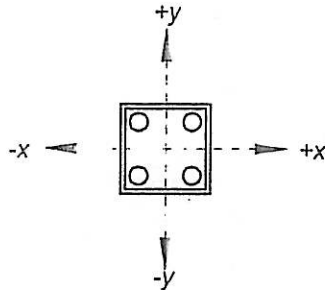
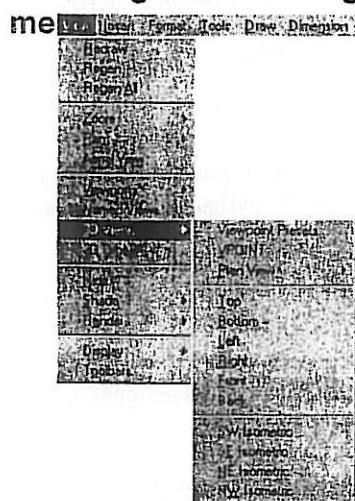


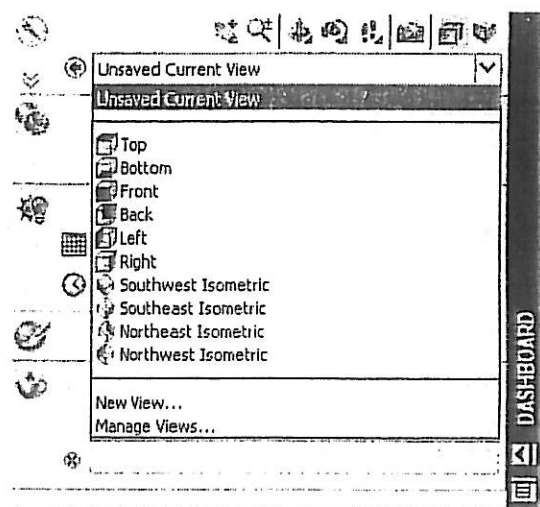
fig.XI-6. Using the X,Y,Z coordinate to create view using vpoint

| NAME VIEWS     | X  | Y  | Z  |
|----------------|----|----|----|
| TOP            | 0  | 0  | 1  |
| BOTTOM         | 0  | 0  | -1 |
| LEFT           | -1 | 0  | 0  |
| RIGHT          | 1  | 0  | 0  |
| FRONT          | 0  | -1 | 0  |
| BACK           | 0  | 1  | 0  |
| SOUTH WEST ISO | -1 | -1 | 1  |
| SOUTH EAST ISO | 1  | -1 | 1  |
| NORTH EAST ISO | 1  | 1  | 1  |
| NORTH WEST ISO | -1 | 1  | 1  |
|                | -1 | -2 | 3  |
|                | 1  | 1  | -1 |

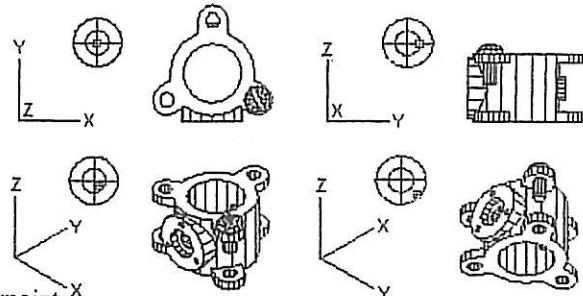
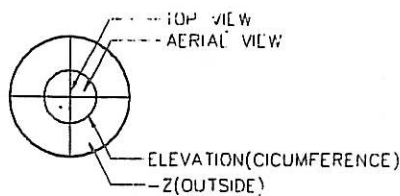
### 2. Setting a View using Pull down



### 3. From the DASHBOARD



### 4. Setting a View with the Compass and Axis Tripod



Examples of compass and axis tripod for various viewpoint



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## F: VPORTS

Creates multiple viewports.

Command : **VPORTS** (enter)

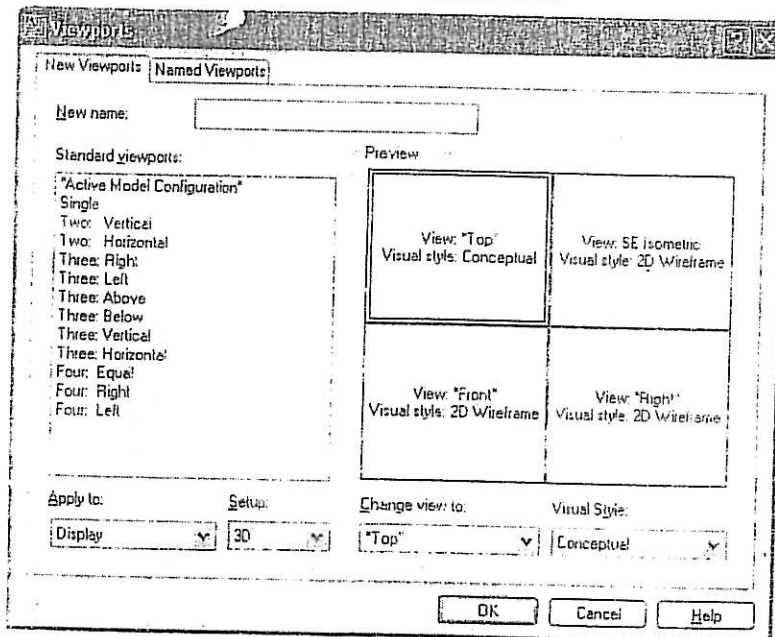


fig.XI-7. Using vports dialog box



fig.XI-8. Using pull down menu

### New name:

Specifies a name for the new tiled viewport configuration you are creating. If you do not enter a name, the viewport configuration you create is applied but not saved. If a viewport configuration is not saved, it cannot be used in a layout.

### Standard viewports:

Lists the standard viewport configurations available. It also contains a CURRENT item, the current configuration.

### Preview

Displays a preview of the viewport configuration you select and the default views assigned to each individual viewport in the configuration.

### Apply to:

Applies the tiled viewport configuration to the entire Display or to the Current Viewport.

**Display:** Applies the viewport configuration to the entire Model tab display. Display is the default setting.

**Current Viewport:** Applies the viewport configuration to the current viewport only.

### Setup:

Specifies either a 2D or a 3D setup. When you select 2D, the new viewport configuration is initially created with the current view in all of the viewports. When you select 3D, a set of standard orthogonal 3D views is applied to the viewports in the configuration.

### Change view to:

Replaces the selected viewport configuration with the viewport configuration you select from the list. You can choose a named viewport configuration, or if you have selected 3D setup, you can select from the list of standard viewport configurations. Use the Preview area to view the viewport configuration choices.

### Visual Styles

To set shading mode for each viewport.



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## User Coordinate System

**UCS** sets the orientation of the User Coordinate System in 3D space. It defines the orientation for 2D objects and the extrusion direction for THICKNESS. It also provides the axis of rotation for ROTATE and the default projection plane for pointing.

**UCSICON**- controls placement and visibility of UCSICON. The UCS icon represents the orientation of the UCS axes and the location of the current UCS origin. It also represents the current viewing direction relative to the UCS XY plane.

You can choose one of the three styles of icon to represent the UCS.

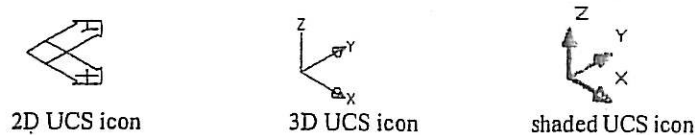
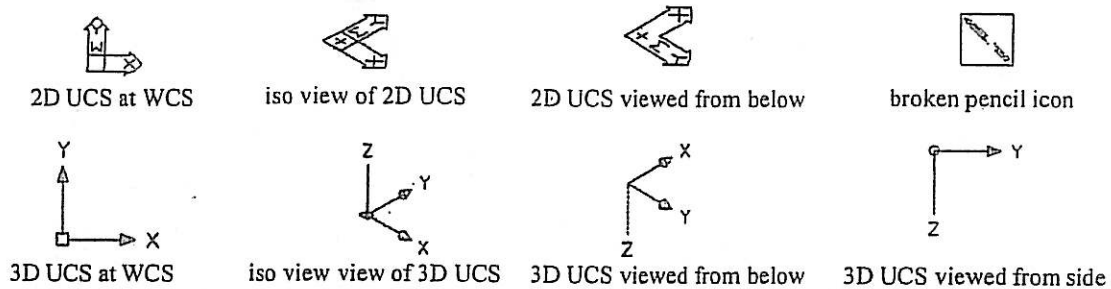


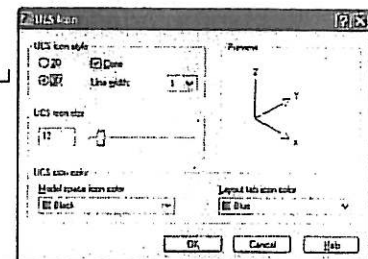
fig. XII-11. Showing different UCS-icon orientation



### To Set UCS icon properties

Command : **UCSICON**

Enter an option [ON/OFF/All/Noorigin/Origin/Properties] <ON> : **P**



Dialog box of UCS icon

- UCS** - Manages user coordinate systems
- World UCS** -Sets the UCS to the World Coordinate System
- UCS Previous** -Restores the previous UCS
- Face UCS** -Defines a new coordinate system based on a selected face
- Object UCS** -Defines a new coordinate system based on a selected object
- View UCS** -Establishes a new coordinate system with the XY plane parallel to the screen
- Origin UCS** -Defines a new UCS by shifting the origin
- Z Axis Vector UCS** -Defines a UCS using a positive Z axis extrusion method
- 3 Point UCS** -Specifies the new UCS origin and the direction of the X and Y axes
- X Axis** -Rotates the current UCS about the X axis
- Y Axis** -Rotates the current UCS about the Y axis
- Z Axis** -Rotates the current UCS about the Z axis
- Apply UCS** -Applies current UCS to a selected viewport: UCS APPLY



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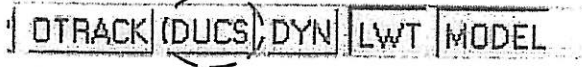
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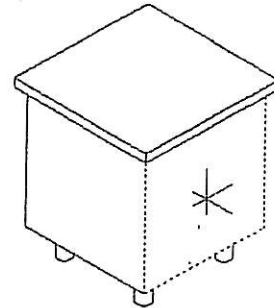
### Working with Dynamic UCS

With the dynamic UCS feature, you can temporarily and automatically align the XY plane of the UCS with a plane on a **solid model** while creating objects.

When in a draw command, you align the UCS by moving your pointer over an edge of a face rather than having to use the UCS command. After you finish the command, the UCS returns to its previous location and orientation.



The dynamic UCS is available only while a command is active.

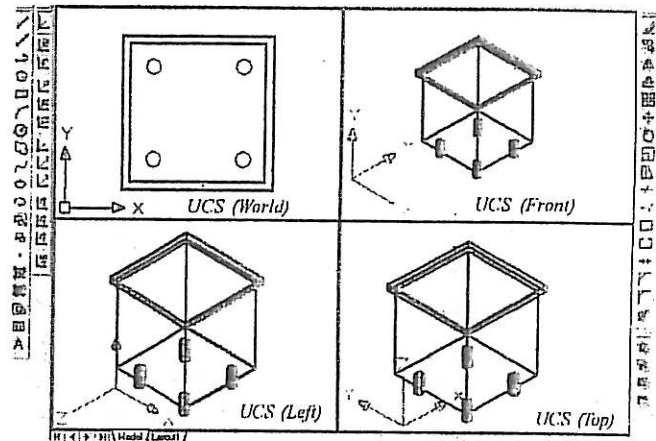


### Working with UCSs in Viewports

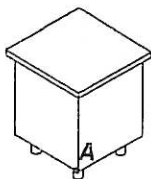
Multiple viewports provide different views of your model. For example, you might set up viewports that display a top view, right and left side views, and a bottom view. To facilitate editing objects in different views, you can define a different UCS for each view.



The UCS in each viewport is controlled by the UCSVP system variable. When UCSVP is set to 0 in a viewport, its UCS is always the same as the UCS in the current viewport. When UCSVP is set to 1 in a viewport, the UCS is locked to the UCS last used in that viewport and does not change to match the UCS of the current viewport.



### STEP 3 Creating the drawer



i. Set **DUCS** on (F6)

ii. Command : **Rectang**

(Note: move the pointer on the face of the box)

Sp. 1st cor.pt : **FROM**

Base pt : **End (A)**

(Note: Leave the pointer on the face of the box while typing)

Offset : **@0.075,0.10**

: **@ 0.30, 0.10**

iii. Command : **Copy**

Sel. obj. : **pick (B)**

Sel. obj. : **(enter)**

Sp. Base pt : **0,0,0.20**

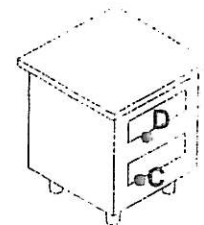
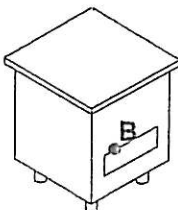
Sp. 2nd pt : **←**

iv. Command : **EXTRUDE**

Sel. obj to extrude: **pick (C & D)**

Sel. obj. to extrude: **(enter)**

Sp. ht. of extrusion: **0.020**



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## G: SYSTEM VARIABLES TO CONTROL 3D SOLID TRIANGULATIONS & ISOLINES

- 1. FACETRES** - Further adjusts the smoothness of shaded and rendered objects and objects with hidden lines removed. Valid values are from 0.01 to 10.0 steps.



FACETRES=0.50



FACETRES=10

- 2. ISOLINES** - Specifies the number of isolines per surface on objects. Values are from 0 to 2047.



ISOLINES=4



ISOLINES=20

- 3. DISPSILH** - Controls display of silhouette curves of solid objects in wireframe mode. Also controls whether mesh is drawn or suppressed when a solid object is hidden.



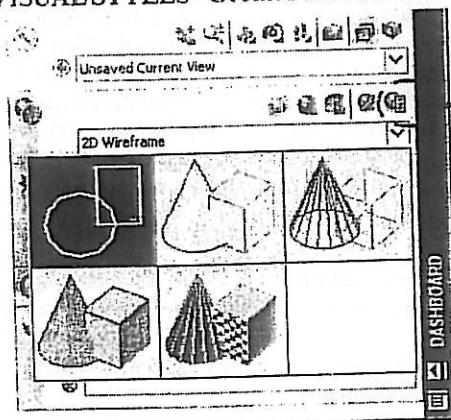
DISPSILH=0



DISPSILH=1

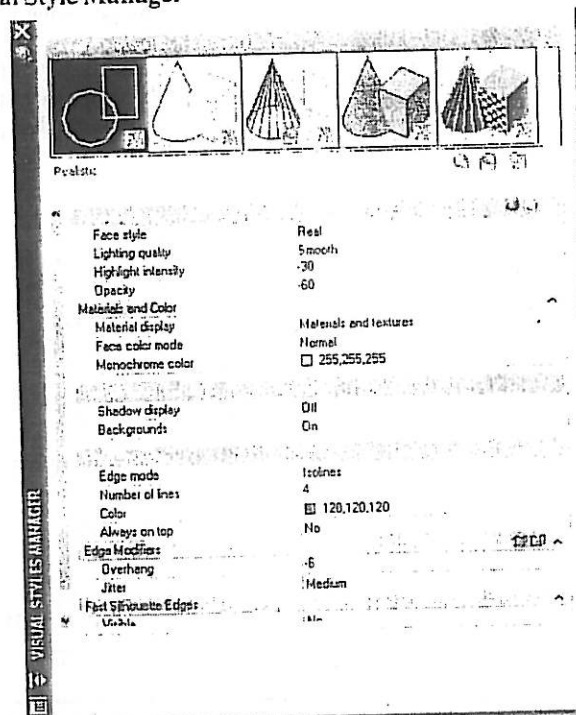
## H: DISPLAY COMMANDS FOR 3D MODELS

**VISUAL STYLES** - Creates and modifies visual styles and applies a visual style to a viewport



Select the visual style to apply to the current viewport

Visual Style Manager


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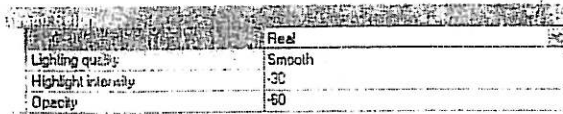
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## To create New Visual Style

1. From the Visual Style Manager, click  , type a name
2. Set the properties of the visual style you've created.



**Real**, the default, is as close as possible to how the face would appear in the real world.

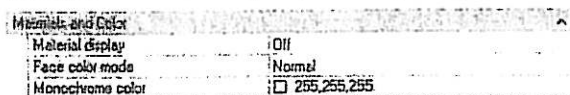
**Gooch** uses cool and warm colors instead of dark and light to enhance the display of faces that might be shadowed and difficult to see in a realistic display.

**None** does not apply a face style. Other face settings are disabled

**Lighting Quality** - Sets the lighting to show facets on the model or not. Smooth is the default.

**Highlight Intensity** - Controls the size of highlights on faces without materials.

**Opacity** - Controls the opacity or transparency of faces in a viewport



### Materials Display

Controls whether materials and textures are displayed.

Face color mode - controls the display of colors on faces.

**Normal**- Does not apply a face color modifier.

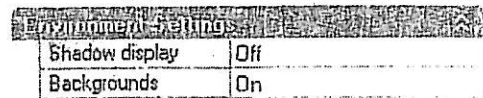
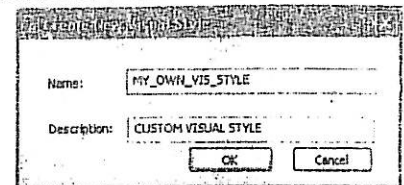
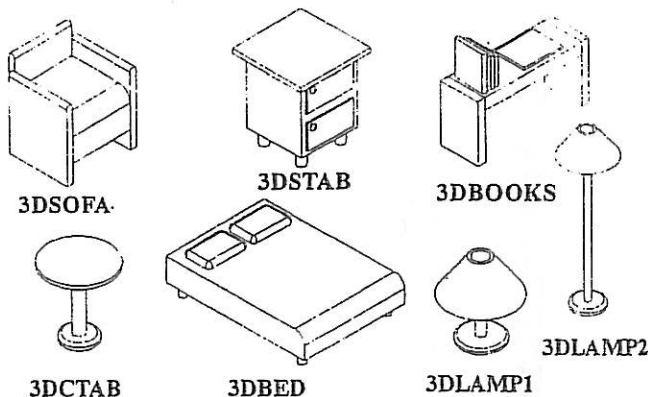
**Monochrome**- Displays the model in shades of the color you specify.

**Tint**- Changes the hue and saturation value of face colors.

**Desaturate**- Softens the color by reducing its saturation component by 30 percent.

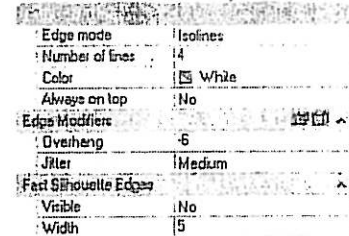
**Monochrome Color/Tint Color**- Displays the Select Color dialog box, where you select the monochrome or tint color, depending on the face color mode. This setting is not available when face color mode is set to Normal or Desaturate.

Exer. Draw the following 3D templates



Controls the display of shadows: no shadows, ground shadows only, or full shadows. Turn shadows off to increase performance

**Backgrounds** - Controls whether backgrounds are displayed in the viewport



**Overhang Button and Setting** - makes lines extend beyond their intersection, for a hand-drawn effect. The button turns the overhang effect on and off. When it is on, you can change the setting.

**Jitter Button and Setting** - makes lines appear sketched. The settings are Low, Medium, and High; each can be turned off. The button turns the jitter effect on and off.

**Crease Angle** - sets the angle at which facet edges within a face are not shown, for a smooth effect.

**Halo Gap %** - specifies the size of a gap to be displayed where an object is hidden by another object. This option is available when the Conceptual or 3D Hidden visual styles, or a visual style based on them, is selected. When the halo gap value is greater than 0, silhouette edges are not displayed.

### Fast Silhouette Edges

Controls settings that apply to silhouette edges. Silhouette edges are not displayed on wireframe or transparent objects.

**Width** - Specifies the width at which silhouette edges are displayed.

**Obscured Edges** - Controls settings that apply to obscured edges when edge mode is set to Facet Edges.

**Visible** - Controls whether obscured edges are displayed.

**Intersection Edges** - Controls settings that apply to intersection edges when edge mode is set to Facet Edges. Visible - Controls whether intersection edges are displayed.

**Color** - Displays the Select Color dialog box, where you can set the color for intersection edges.

**Linetype** - Sets a linetype for intersection edges.



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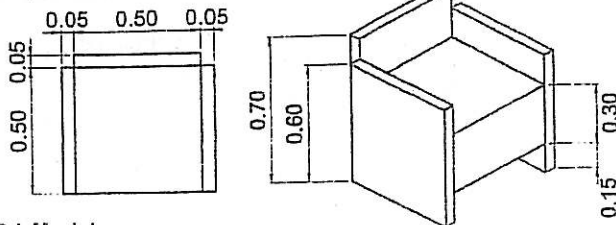
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## 1. 3D SOFA



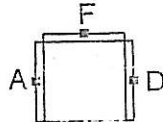
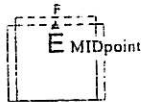
2d Model

## STEP #1 (TRACE) 0

Command : FILL ↵  
               : OFF ↵  
 Command : TRACE ↵  
 Trace width <0.05> : 0.50 ↵  
 Starts point : pick any point (A) ↵  
 Next point : @0.05<0 ↵  
 Next point : @0.50<0 ↵  
 Next point : @0.05<0 ↵  
 Next point : enter ↵



Command : TRACE ↵  
 Trace width <0.50> : 0.50 ↵  
 Starts point : MID of (E) ↵  
 Next point : @0.05<90 ↵  
 Next point : enter ↵



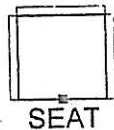
3d Model

## STEP #2 (EXTRUDE (backrest))

Command : EXT ↵  
 Select objects to extrude : pick (F) ↵  
 Select objects to extrude : enter ↵  
 Specify height of extrusion or [Direction/Path/Taper angle]: 0.70 ↵

## STEP #3 (EXTRUDE (armrest))

Command : EXT ↵  
 Select objects to extrude : pick (A & D) ↵  
 Select objects to extrude : enter ↵  
 Specify height of extrusion or [Direction/Path/Taper angle]: 0.60 ↵



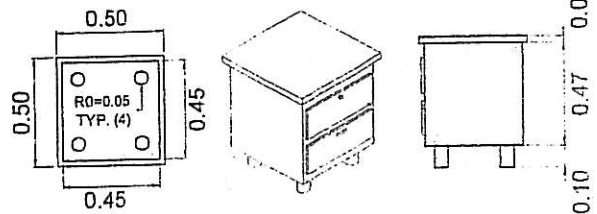
## STEP #4 (EXTRUDE and MOVE (seat))

Command : EXT ↵  
 Select objects to extrude : pick (seat) ↵  
 Select objects to extrude : enter ↵  
 Specify height of extrusion or [Direction/Path/Taper angle]: 0.30 ↵  
 Command : M ↵  
 Select Objects : pick (seat) ↵  
 Select Objects : enter ↵  
 Base point or displacement : 0,0,0.15 ↵  
 Second point of displacement : enter ↵

## STEP #5

Command : BLOCK (use OSNAP off)

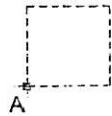
## 2. 3D STAB



2d Model

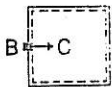
## STEP #1 (RECTANG)

Command : REC ↵  
 1<sup>st</sup> cor. pt [C/E/F/T/W] : pick pt. (A) ↵  
 Other cor. pt. [Dim.] : @0.50,0.50 ↵



## STEP #2 (OFFSET)

Command : O ↵  
 Offset distance <1.00> : 0.03 ↵  
 Select obj. <exit> : pick (B) ↵  
 Side to offset : pick (C) ↵



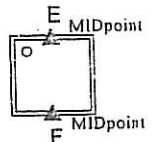
## STEP #3 (CIRCLE)

Command : C ↵  
 Center point [3P/2P/Ttr] : pick (D) ↵  
 Radius or [Diameter] : 0.025 ↵



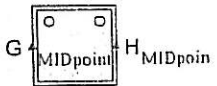
## STEP #4 (MIRROR)

Command : Mi ↵  
 Select objects : L ↵ (last created object)  
 Select objects : enter ↵  
 First pt. of mirror line : Mid of (E) ↵  
 Second point : Mid of (F) ↵  
 Del. source objs.? [Y/N] <N> : enter ↵



## STEP #5 (MIRROR)

Command : Mi ↵  
 Select objects : L ↵ (last selected object)  
 Select objects : P ↵ (previously selected obj.)  
 Select objects : enter ↵  
 First pt. of mirror line : Mid of (G) ↵  
 Second point : Mid of (H) ↵  
 Del. source objs.? [Y/N] <N> : enter ↵



3D Solid

## STEP #6 (EXTRUDE (all circles))

Command : EXT ↵  
 Select objects to extrude : pick (all circles) ↵  
 Select objects to extrude : enter ↵  
 Specify height of extrusion or [Direction/Path/Taper angle] : 0.10 ↵



## STEP #7 (EXTRUDE and MOVE (small rectang))

Command : EXT ↵  
 Select objects to extrude : pick (I) ↵  
 Select objects to extrude : enter ↵  
 Specify height of extrusion or [Direction/Path/Taper angle] : 0.47 ↵



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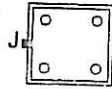
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Command : **M** ↵  
 Select objects : **pick (I)**  
 Select objects : **enter**  
 Base pt. or displacement : **0,0,0.10** ↵  
 2<sup>nd</sup> point of displacement : **enter**



### STEP # 8 (EXTRUDE and MOVE (big rectang))

Command : **EXT** ↵  
 Select objects to extrude : **pick (J)**  
 Select objects to extrude : **enter**  
 Specify height of extrusion or [Direction/Path/Taper angle] : **0.03** ↵

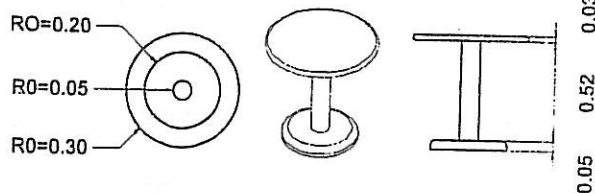


Command : **M** ↵  
 Select objects : **pick (J)**  
 Select objects : **enter**  
 Base pt. or displacement : **0,0,0.57** ↵  
 2<sup>nd</sup> point of displacement : **enter**

### STEP # 9

Command: **BLOCK** (use OSNAP off)

### 3. 3D CTAB

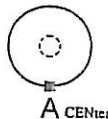


### 2d Model

STEP # 1 (CIRCLE A (base))  
 Command : **C** ↵  
 Center pt. [3P/2P/Ttr] : **pick any point**  
 Radius of circle [Dia.] : **0.20** ↵



STEP # 2 (CIRCLE B (stand))  
 Command : **C** ↵  
 Center pt. [3P/2P/Ttr] : **CEN of (A)**  
 Radius of circle [Dia.] : **0.05** ↵

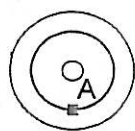


STEP # 3 (CIRCLE C (top))  
 Command : **C** ↵  
 Center pt. [3P/2P/Ttr] : **CEN of (A)**  
 Radius of circle [Dia.] : **0.30** ↵



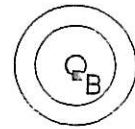
### 3D Solid

STEP # 4 (EXTRUDE (circle A base))  
 Command : **EXT** ↵  
 Select objects to extrude : **pick circle (A)**  
 Select objects to extrude : **enter**  
 Specify height of extrusion or [Direction/Path/Taper angle] : **0.05** ↵



### STEP # 5 (EXTRUDE and MOVE (circle B stand))

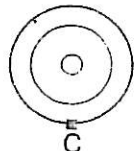
Command : **EXT** ↵  
 Select objects to extrude : **pick circle (B)**  
 Select objects to extrude : **enter**  
 Specify height of extrusion or [Direction/Path/Taper angle] : **0.52** ↵



Command : **M** ↵  
 Select objects : **pick circle (B)**  
 Select objects : **enter**  
 Base point or displacement : **0,0,0.05** ↵  
 Second point of displacement : **enter**

### STEP # 6 (EXTRUDE and MOVE (circle C (top)))

Command : **EXT** ↵  
 Select objects to extrude : **pick circle (C)**  
 Select objects to extrude : **enter**  
 Specify height of extrusion or [Direction/Path/Taper angle] : **0.03** ↵

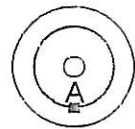


Command : **M** ↵  
 Select objects : **pick circle (C)**  
 Select objects : **enter**  
 Base point or displacement : **0,0,0.57** ↵  
 Second point of displacement : **enter**

### Solid Editing

### STEP # 9 (FILLET r=0.03 (circle A (base)))

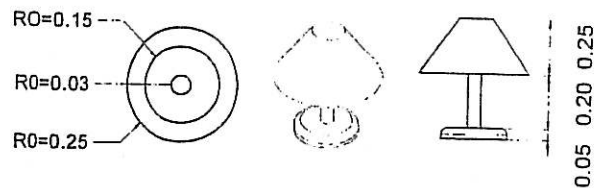
Command : **F** ↵  
 P/Rad/Tr/Select 1<sup>st</sup> obj> : **pick (A)**  
 Enter radius : **0.03**  
 Chain/Rad/Select edge> : **enter**



### STEP # 10

Command : **BLOCK** (use OSNAP off)

### 4. 3D LAMP1

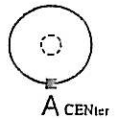


### 2D model

STEP # 1 (CIRCLE A (base))  
 Command : **C** ↵  
 Center pt. [3P/2P/Ttr] : **pick any point**  
 Radius of circle [Dia.] : **0.15** ↵



STEP # 2 (CIRCLE B (stand))  
 Command : **C** ↵  
 Center pt. [3P/2P/Ttr] : **CEN of (A)**  
 Radius of circle or [Dia.] : **0.03** ↵



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## STEP #3 (CIRCLE C (lamp))

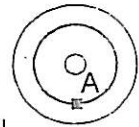
Command : C ↵  
 Center pt. [3P/2P/Ttr] : CEN of (A) ↵  
 Radius of circle or [Dia.]: 0.25 ↵



## 3d Solid

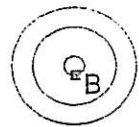
## STEP #4 (EXTRUDE (circle A (base)))

Command : EXT ↵  
 Select objects to extrude : pick circle (A) ↵  
 Select objects to extrude : enter ↵  
 Specify height of extrusion  
 or [Direction/Path/Taper angle] : 0.05 ↵



## STEP #5 (EXTRUDE and MOVE (circle B (stand)))

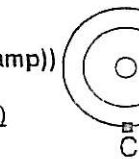
Command : EXT ↵  
 Select objects to extrude : pick circle (B) ↵  
 Select objects to extrude : enter ↵  
 Specify height of extrusion  
 or [Direction/Path/Taper angle]: 0.20 ↵



Command : M ↵  
 Select objects : pick circle (B) ↵  
 Select objects : enter ↵  
 Base point or displacement : 0,0,0.05 ↵  
 Second point of displacement : enter ↵

## STEP #6 (EXTRUDE and MOVE (circle C (lamp)))

Command : EXT ↵  
 Select objects to extrude : pick Circle (C) ↵  
 Select objects to extrude : enter ↵  
 Specify height of extrusion or [Direction/Path/Taper  
 angle]: T ↵  
 Specify angle of taper for extrusion <0>: 35 ↵  
 Specify height of extrusion or [Direction/Path/Taper  
 angle]: 0.25 ↵

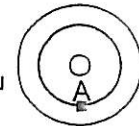


Command : M ↵  
 Select objects : pick circle C ↵  
 Select objects : enter ↵  
 Base point or displacement : 0,0,0.25 ↵  
 Second point of displacement : enter ↵

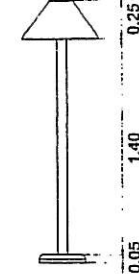
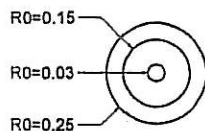
## Solid Editing

## STEP #7 (FILLET R=0.03 (circle A (base)))

Command : F ↵  
 Pline/Rad/Tr/<Sel. 1st object> : pick A ↵  
 Enter radius : 0.03 ↵  
 Chain/Radius/<Select edge> : enter ↵



## STEP #8

Command: BLOCK  
5. 3D LAMP2

## STEP #1 (CIRCLE A (base))

Command : C ↵  
 Center pt. [3P/2P/Ttr] : pick any point ↵  
 Radius of circle [Dia.]: 0.15 ↵



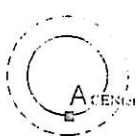
## STEP #2 (CIRCLE B (base))

Command : C ↵  
 Center pt. [3P/2P/Ttr] : CEN of (A) ↵  
 Radius of circle [Dia.]: 0.03 ↵



## STEP #3 (CIRCLE C (lamp))

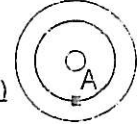
Command : C ↵  
 Center pt. [3P/2P/Ttr] : CEN of (A) ↵  
 Radius of circle or [Dia.]: 0.25 ↵



## 3d Solid

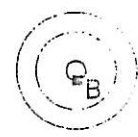
## STEP #4 (EXTRUDE (circle A base))

Command : EXT ↵  
 Select objects to extrude : pick circle (A) ↵  
 Select objects to extrude : enter ↵  
 Specify height of extrusion or [Direction/Path/Taper  
 angle] : 0.05 ↵



## STEP #5 (EXTRUDE and MOVE (circle B stand))

Command : EXT ↵  
 Select objects to extrude : pick circle (B) ↵  
 Select objects to extrude : enter ↵  
 Specify height of extrusion or [Direction/Path/Taper  
 angle] : 1.40 ↵

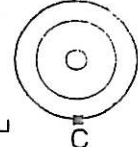


Command : M ↵  
 Select objects : pick circle (B) ↵  
 Select objects : enter ↵  
 Base point or displacement : 0,0,0.05 ↵  
 Second point of displacement : enter ↵

## STEP #6 (EXTRUDE and MOVE (circle C lamp))

Command : EXT ↵  
 Select objects to extrude : pick Circle (C) ↵  
 Select objects to extrude : enter ↵  
 Specify height of extrusion or [Direction/Path/Taper  
 angle]: T ↵  
 Specify angle of taper for extrusion <0>: 35 ↵  
 Specify height of extrusion or [Direction/Path/Taper  
 angle]: 0.25 ↵

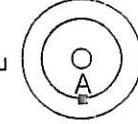
Command : M ↵  
 Select objects : pick circle C ↵  
 Select objects : enter ↵  
 Base point or disp. : 0,0,1.45 ↵  
 2nd point of displacement : enter ↵



## Solid Editing

## STEP #7 (FILLET r=0.03 (circle A base))

Command : F ↵  
 Pline/Rad/Tr/<Sel. 1st object> : pick A ↵  
 Enter radius : 0.03 ↵  
 Chain/Radius/<Select edge> : enter ↵



## STEP #8

Command: BLOCK (use OSNAP off)



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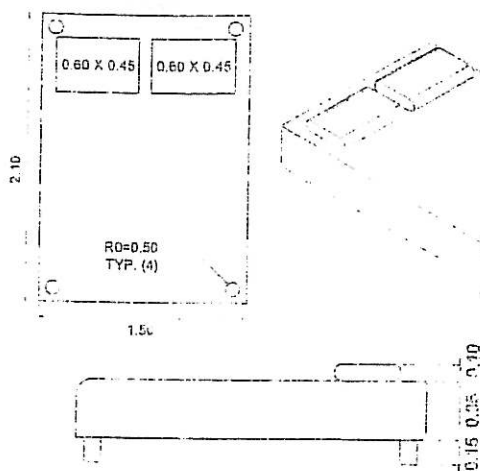
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## 6. 3D BED



## 2D Model

## STEP #1 (RECTANG)

Command : REC1<sup>st</sup> cor. pt. [C/E/F/T/W] : pick pt. (A)Other cor. pt. [Dim.] : @1.50,2.10

## STEP #2 (RECTANG)

Command : REC1<sup>st</sup> cor. pt. [C/E/F/T/W] : pick pt. (B)Other cor. pt. [Dim.] : @0.6-0.40

## ZOOM (EXTENTS)

## STEP #3 (MIRROR)

Command : MSelect objects : pick (C)Select objects : enter1<sup>st</sup> pt. of mirror line : MID of (D)Second point : MID of (E)Del. source objs.? [Y/N] <N> : enter

## STEP #4 (CIRCLE)

Command : CCenter pt. [3P/2P/Ttr] : pick pt. (F)Radius or [Diameter] : 0.05

## STEP #5 (COPY)

Command : COPYSelect objects : L (last created object)Select objects : enterBase pt. or disp. [Multiple] : MBase point : pick G2<sup>nd</sup> point of displacement : pick H2<sup>nd</sup> point of displacement : pick I2<sup>nd</sup> point of displacement : pick J2<sup>nd</sup> point of displacement : enter

## 3D Solid

## STEP #6 (EXTRUDE) (legs)

Command : EXTSelect objects to extrude : pick (all circles)Select objects to extrude : enterSpecify height of extrusion or [Direction/Path/Taper angle] : 0.15

## STEP #7 (EXTRUDE and MOVE (bed))

Command : EXTSelect objects to extrude : pick (K)Select objects to extrude : enterSpecify height of extrusion or [Direction/Path/Taper angle] : 0.35Command : MSelect objects : pick (K)Select objects : enterBase point or displacement : 0,0,0.15Second point of displacement : enter

## STEP #8 (EXTRUDE and MOVE (pillow))

Command : EXTSelect objects to extrude : pick (L)Select objects to extrude : pick (M)Select objects to extrude : enterSpecify height of extrusion or [Direction/Path/Taper angle] : 0.10Command : MSelect objects : pick (L)Select objects : pick (M)Select objects : enterBase point or displacement : 0,0,0.50Second point of displacement : enter

## Solid Editing

## STEP #9 FILLET r=0.05 (pillow)

Command : FPline/Rad/Tr/<Select 1<sup>st</sup> object> : pick (N)Enter radius : 0.05Chain/Radius/<Select edge> : pick (O)Chain/Radius/<Select edge> : pick (P)Chain/Radius/<Select edge> : pick (Q)Chain/Radius/<Select edge> : enter

## STEP #10

Command: BLOCK

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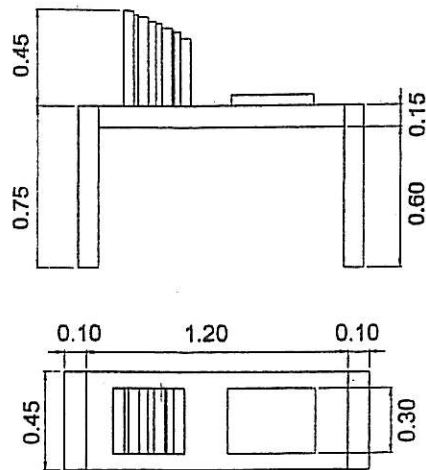
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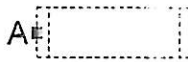
## 7. 3D BOOKS



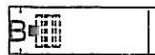
## 2D Model

## STEP #1 (TRACE)

Command : TRACE ↵  
 Trace width <0.05> : 0.45 ↵  
 Start point : pick pt. (A) ↵  
 To point : @ 0.1<0 ↵  
 To point : @ 1.20<0 ↵  
 To point : @ 0.1<0 ↵  
 To point : enter ↵



Command : TRACE ↵  
 Trace width <0.05> : 0.30 ↵  
 Start point : pick pt. (B) ↵  
 To point : @ 0.05<0 ↵  
 To point : @ 0.03<0 ↵  
 To point : @ 0.02<0 ↵  
 To point : @ 0.05<0 ↵  
 To point : @ 0.04<0 ↵  
 To point : @ 0.03<0 ↵  
 To point : enter ↵



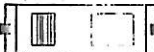
Command : TRACE ↵  
 Trace width <0.05> : 0.30 ↵  
 Start point : pick (C) ↵  
 To point : @ 0.4<0 ↵  
 To point : enter ↵



## 3D Solid

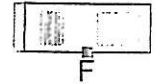
## STEP #4 (EXTRUDE (legs))

Command : EXT ↵  
 Select objects to extrude : pick (D & E) ↵  
 Select objects to extrude : enter ↵  
 Specify height of extrusion or [Direction/Path/Taper angle] : 0.75 ↵



## STEP #5 (EXTRUDE and MOVE (top))

Command : EXT ↵  
 Select objects to extrude : pick (F) ↵  
 Select objects to extrude : enter ↵  
 Specify height of extrusion or [Direction/Path/Taper angle] : 0.15 ↵



Command : M ↵  
 Select objects : pick (F) ↵  
 Select objects : enter ↵  
 Base point or displacement : 0,0,0.60 ↵  
 Second point of displacement : enter ↵



## STEP #6 (EXTRUDE and MOVE (books))

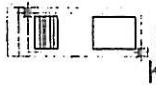
Command : EXT ↵  
 Select objects to extrude : pick (G & H) ↵  
 Select objects to extrude : enter ↵  
 Specify height of extrusion or [Direction/Path/Taper angle] : 0.40 ↵



Command : EXT ↵  
 Select objects : pick (I) ↵  
 Select objects : enter ↵  
 Height of extrusion or [Path] : 0.06 ↵  
 Angle of taper for extrusion <0> : enter ↵



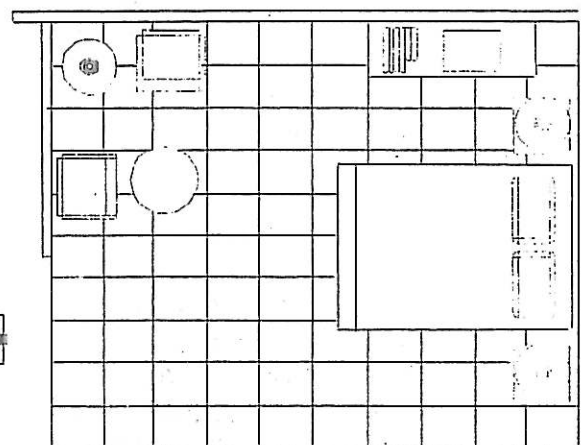
Command : MOVE ↵  
 Select objects : pick (J & K) ↵  
 Select objects : enter ↵  
 Base pt. or displacement : 0,0,0.75 ↵  
 2nd point of displacement : enter ↵



## STEP #7

Command: BLOCK

## Interior Plan view at Master Bedroom



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Exer. # 3: Complete 3D model of Master's Bedroom

### STEP A USE A: TEMPLATE

Command : NEW (enter)



Look in : C:\LIB (Filename: INTERIOR)

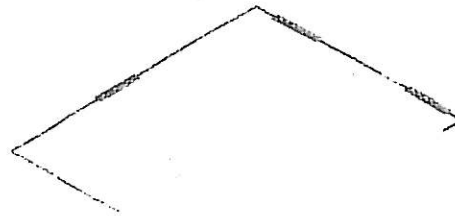
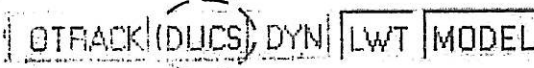


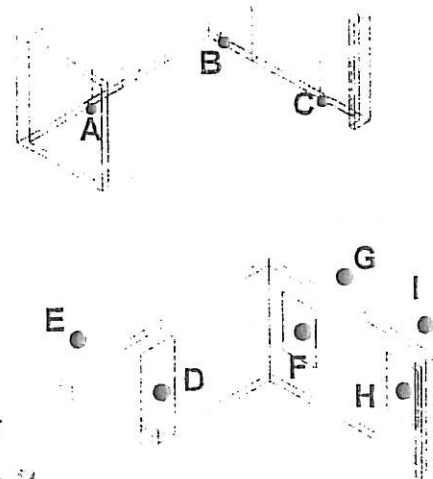
fig XI-10 Using a template to import dwg file

### STEP B - Creating 3D Walls using Polysolid command

- Command : PSOLID (Polysolid)  
Specify start point or [Object/Height/Width/Justify] <Object>: J  
Enter justification [Left/Center/Right] : C  
Specify start point or [Object/Height/Width/Justify] <Object>: W  
Specify width : 0.15  
Specify start point or [Object/Height/Width/Justify] <Object>: H  
Specify height : 2.40  
Specify start point or [Object/Height/Width/Justify] <Object>: O  
Select object: pick the polyline

### STEP C - Creating Door & Windows (DUCS & PressPull)

- C.1 Set DUCS ON (F6) 
- C.2 Command : Rectang  
: End (A)  
: @0.80, 2.10
- C.3 Command : Rectang  
: End (B)  
: @0.80, 1.20
- C.3 Command : Rectang  
: End (C)  
: @0.80, 1.20
- C.4 Command : Move (for windows)  
Select objects : pick the two rectang  
Select objects : pick  
Sp. Base pt : 0.0,0.80  
Sp. 2nd pt : pick
- C.5 Apply the command PressPull to cut an opening for door and windows  
Note: Set DUCS on (F6)   
Command : Presspull  
Click inside bounded areas to press or pull. : pick (D) & drag, pick (E)  
Command : Presspull  
Click inside bounded areas to press or pull. : pick (F) & drag, pick (G)  
Command : Presspull  
Click inside bounded areas to press or pull. : pick (H) & drag, pick (I)



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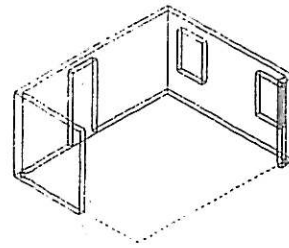
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## STEP D: FLOORING AND CEILING

### 1) LAYER

Command : LA (enter)  
Name : TILES  
Color : MAGENTA  
\*make it current\*



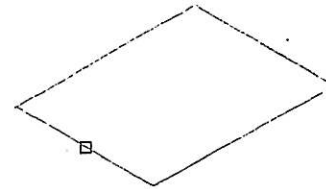
### 2) RECTANG

Command : REC (enter)  
Specify first corner point or [Chamfer/Elevation/Fillet/Thickness/Width] : END of pick (C)  
Specify other corner point : END of pick (D)

## STEP E: APPLYING EDGESURF or REGION

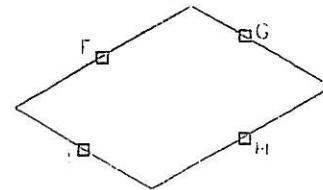
### 1) EXPLODE

Command : X (enter)  
Select objects : pick (E) (rectang)  
Select objects : press enter



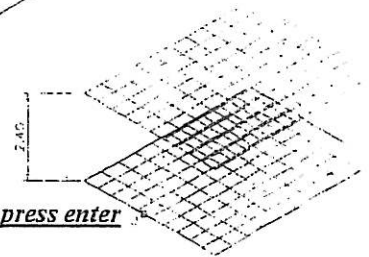
### 2) EDGESURF

Command : EDGESURF (enter)  
Current wire frame density: SURFTAB1=10 SURFTAB2=10  
Select object 1 for surface edge : pick line (F)  
Select object 2 for surface edge : pick line (G)  
Select object 3 for surface edge : pick line (H)  
Select object 4 for surface edge : pick line (I)



### 3) COPY

Command : CO (enter)  
Select objects : pick (J) (flooring)  
Select objects : press enter  
Specify base point or displacement, or [Multiple] : 0,0,2.40  
Specify second point of displacement or <use first point as displacement> : press enter

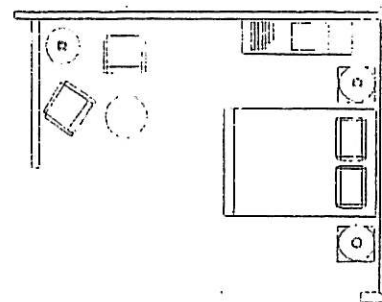


## STEP F: INSERTING FURNITURE (use Insert, Xref or ADC)

Command : LA (enter)  
Name : FURNITURE  
Color : RED

Command : ADC

3dsofa  
3dctab  
3dlamp1  
3dlamp2  
3dbed  
3dstab



Showing location of  
furnitures



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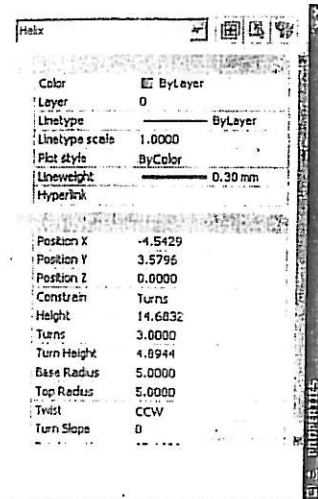
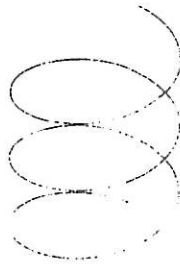
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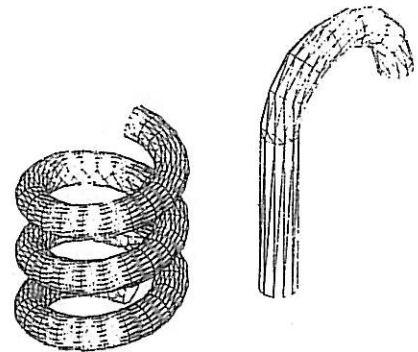
## OTHER 3D RELATED COMMANDS



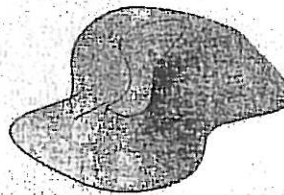
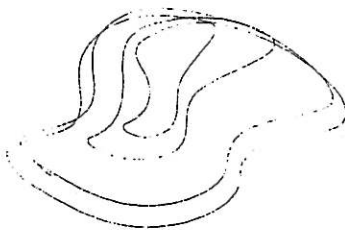
1. **HELIX** - A helix is an open 2D or 3D spiral



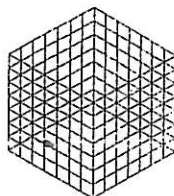
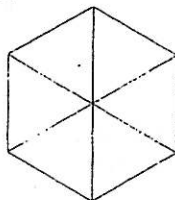
2. **SWEEP** - creates a new solid or surface by sweeping an open or closed planar curve (profile) along an open or closed 2D or 3D path.



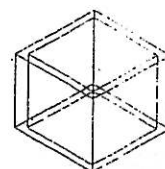
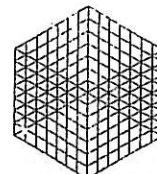
3. **LOFT** - creates a 3D solid or surface by lofting (drawing a solid or surface) through a set of two or more cross-section curves.



4. **CONVTOSURFACE** - Converts objects to surfaces



5. **THICKEN** - Creates a 3D solid by thickening a surface



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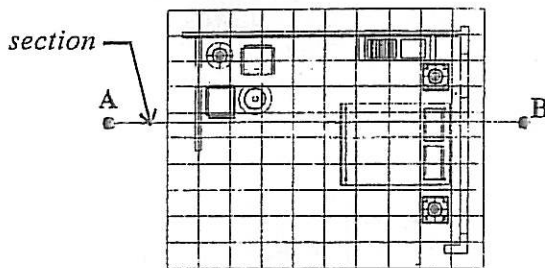
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## To Create 2D/3D Section

Step 1 Open the INTERIOR file



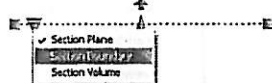
Step 2 Apply the command SECTIONPLANE

Command: **SECTIONPLANE**  
Select face or any point to locate section line or  
[Draw section/Orthographic]: **Pick A**  
Specify through point : **Pick B**

Step 3 Click the section plane

Step 4 Click the grip

Step 5 Select the type of section plane

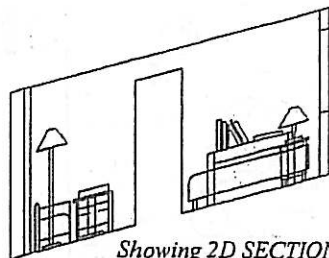


Step 5 Set the view to SOUTHWEST ISOMETRIC

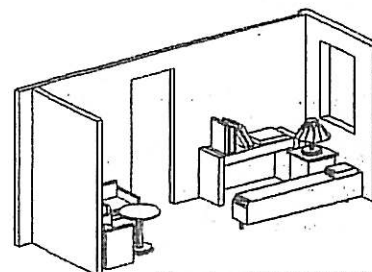
click this grip  
to resize  
section box



click this grip to flip  
the section box



Showing 2D SECTION



Showing 3D SECTION

Step 6 - While the section box is selected, RIGHT-CLICK to display the shortcut menu.

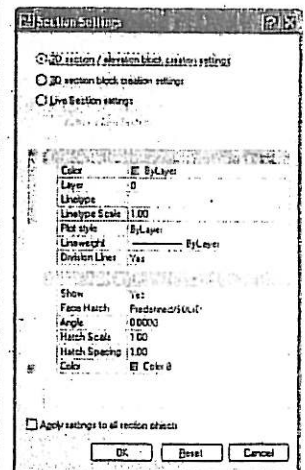
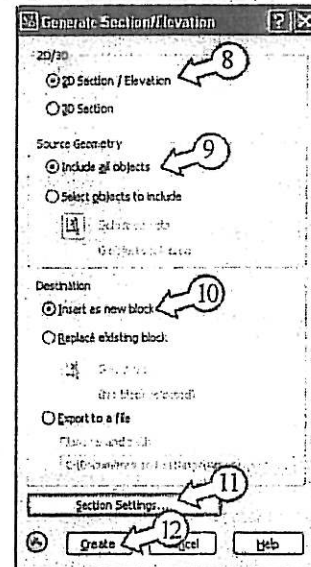
Step 7 - Select **GENERATE 2D/3D SECTION**

Step 8 - Select 2D Section or 3D Section

Step 9 - Specify whether to include all objects or Select objects to include

Step 10 - Select Insert as new block

Step 11 - Click Section Settings button



Section Settings dialog box

Step 12 - Click Create

Step 13 - From the command line, Specify insertion point or [Basepoint/Scale/X/Y/Z/ Rotate]: **pick a location**  
Enter X scale factor, specify opposite corner, or [Corner/XYZ] <1>: **(enter)**  
Enter Y scale factor <use X scale factor>: **(enter)**  
Specify rotation angle <0.0000>: **(enter)**



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## To Generate LIVE 3D SECTION

Step 1 - Click the SECTION BOX

Step 2 - Right-click, select **ACTIVE LIVE SECTIONING**

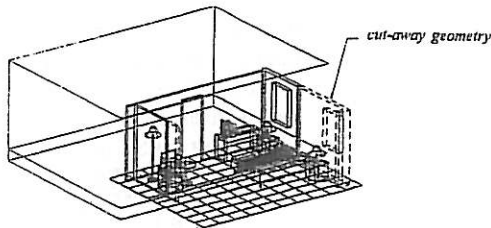
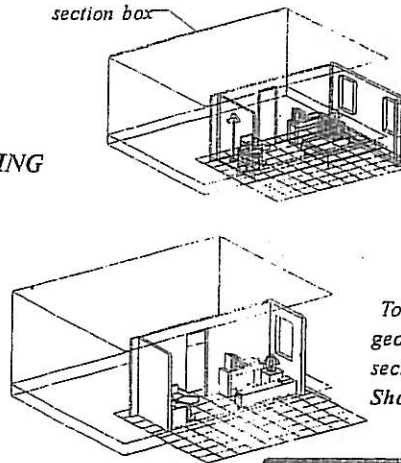


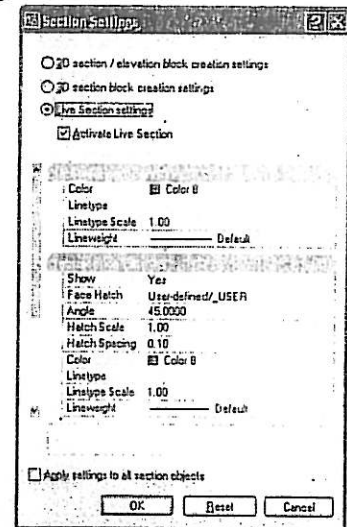
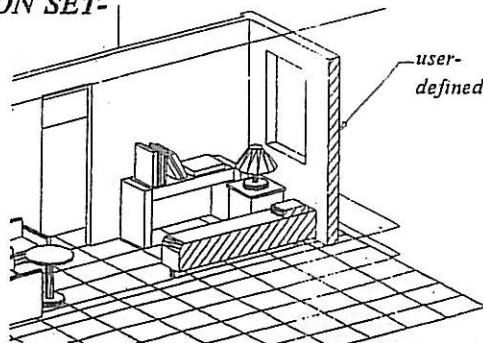
Figure shows LIVE SECTION with CUT-AWAY GEOMETRY is visible



To Toggle the Cut-away geometry, select the section box, right-click >> Show cut-away geometry

## To change the Hatch Pattern of cut objects

Select the section box, right-click, choose **LIVE SECTION SETTINGS...**



## To hide the section plane

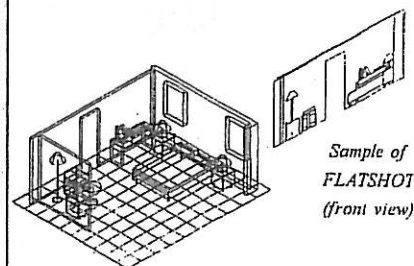
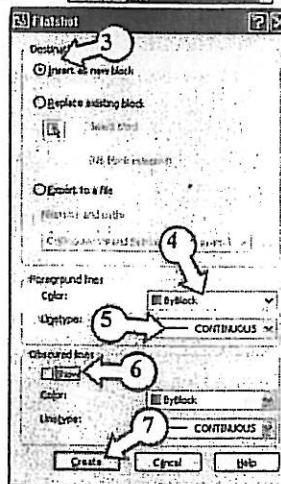
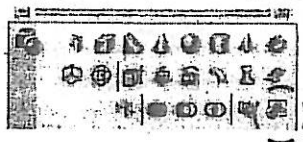
1. Create new layer.
2. Set the layer to OFF.
3. Apply the layer to the section box.
4. Set the VISUAL STYLE to 3DWIREFRAME



## TO GENERATE ELEVATION

1. Set the desired view (eg. FRONT)

2. Apply the command **FLATSHOT**



Sample of FLATSHOT (front view)



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# 3D SURFACE MODEL OF A HOUSE

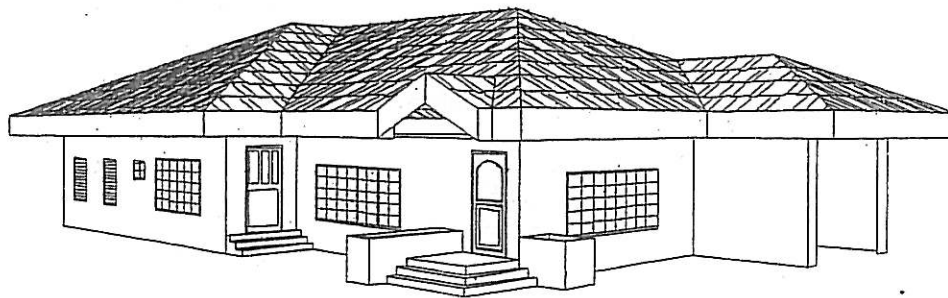


fig.XI-1. Exterior 3D Surface model perspective view

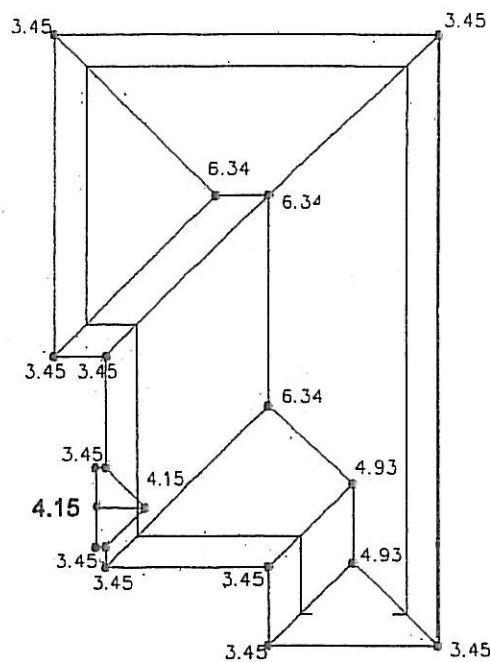


fig.XI-2. Exterior 3D Surface model PLAN VIEW

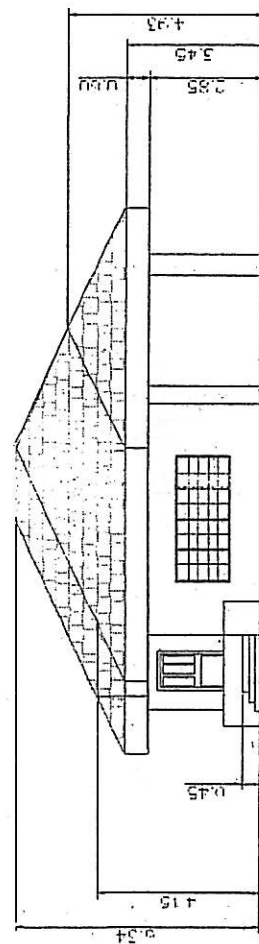


fig.XI-3. Exterior 3D Surface model FRONT VIEW



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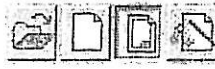
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# Exer. # 1: 3D Exterior Composition

## STEP A: USE A TEMPLATE

 Command : NEW (enter)  
 Use a Template  
Look in : C:\LIB  
File name : EXTERIOR

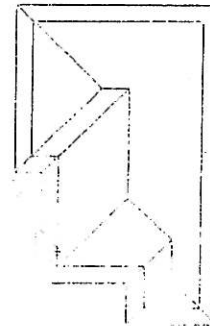


fig.XI-4. Using a template to import a dwt file

## STEP B: VPORTS and VPOINT

 Command : VPORTS (enter)

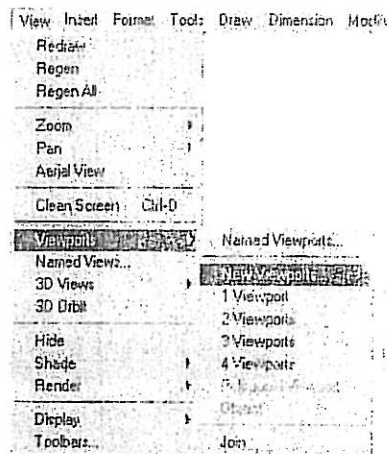


fig. XII-5. Using pull down menu

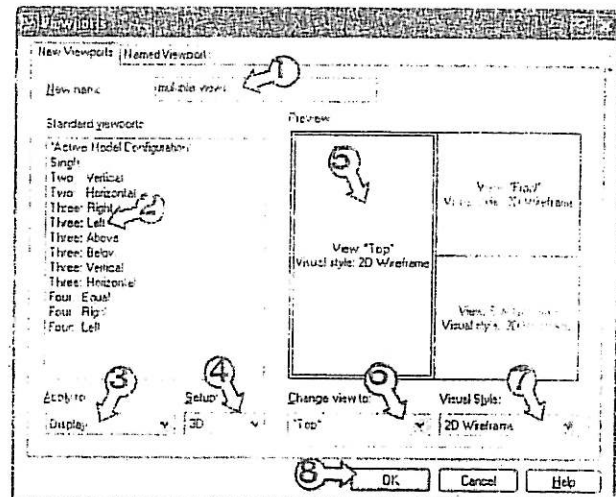
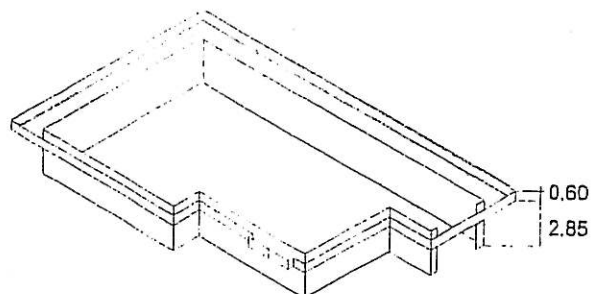


fig.XI-6. Using vports dialog box

## STEP C: 3D SURFACE

 Command : MO (enter)

**Facia board**  
thickness : 0.60  
elevation : 2.85  
  
**Wall**  
thickness : 2.85  
elevation : 0



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**AutoCAD**



- Command : **MO (enter)**
- \* Pick wall or fascia
  - Change the property value in the dialog box
  - Move your pointer in the drawing editor, then press esc (once)

## STEP D: 3DFACE

3DFACE creates a three- or four-sided surface anywhere in 3D space. You can specify different Z coordinate values for each corner point of a 3D face, but if you do, the 3D face cannot be extruded. 3DFACE differs from SOLID, which creates a three- or four-sided surface that is parallel to the current user coordinate system (UCS) and cannot use different Z coordinate values for each corner point. Also, 3DFACE creates a surface that is not filled in; SOLID creates a filled-in surface.

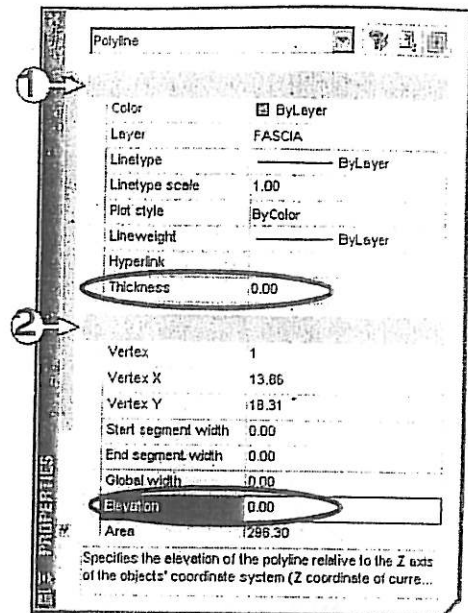
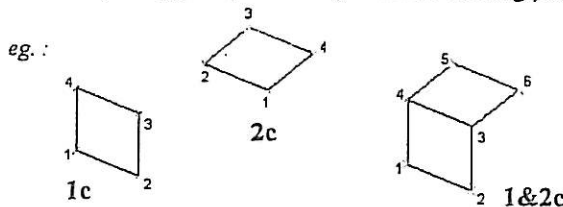
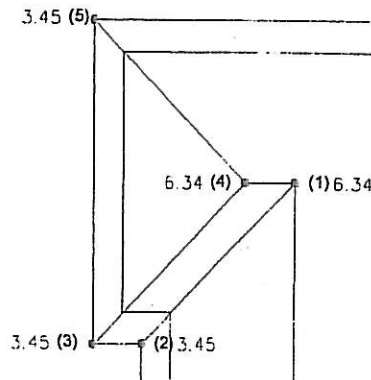


fig.XI-7. Using properties dialog box

- Define the start point for the 3D surface. After entering the first point, enter the remaining points in a natural clockwise or counterclockwise order to create a normal 3D face. If you locate all four points on the same plane, AutoCAD creates a planar face that is similar to a region object. When you shade or render the object, planar faces are filled. AutoCAD repeats the Third Point and Fourth Point prompts until you press ENTER. Specify points 5 and 6 at these repeating prompts. When you finish entering points, press ENTER.



## 1) ROOF I



- Command : **3dface(enter) or 3f (enter)**
- First point : **.XY (enter)**
- of : **pick int (1)**
- (need Z) : **6.34 (enter)**
- Second point : **.XY (enter)**
- of : **pick int (2)**
- (need Z) : **3.45 (enter)**
- Third point : **.XY (enter)**
- of : **pick int (3)**
- (need Z) : **3.45 (enter)**
- Fourth point : **.XY (enter)**
- of : **pick int (4)**
- (need Z) : **6.34 (enter)**
- Third point : **.XY (enter)**
- of : **pick int (5)**
- (need Z) : **3.45 (enter)**
- Fourth point : **press enter**
- Third point : **press enter**
- Command : **QSAVE**



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AutoCAD

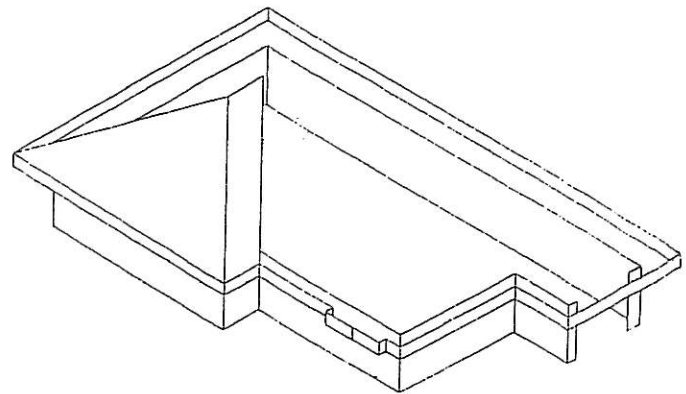
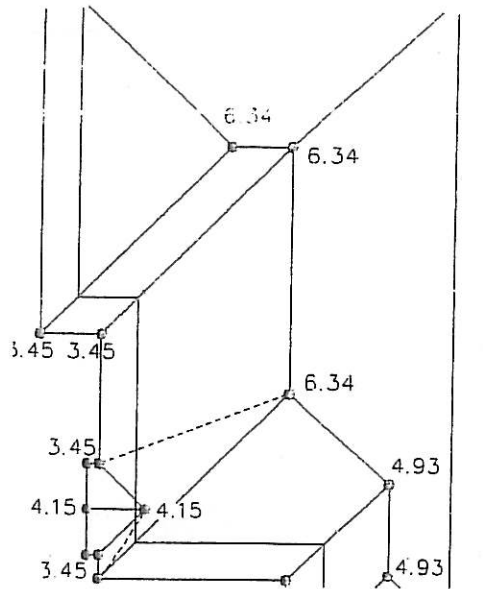
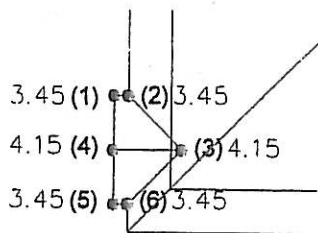
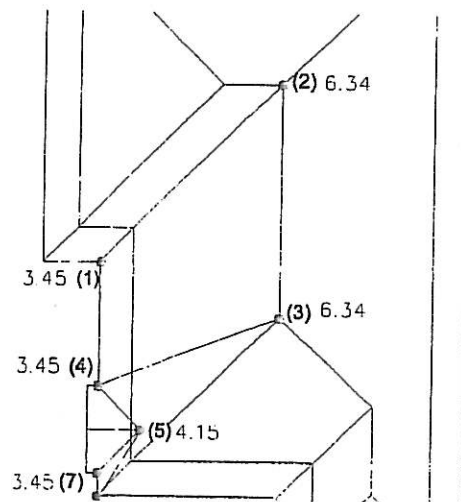


fig.XII-8. Applying 3DFACE

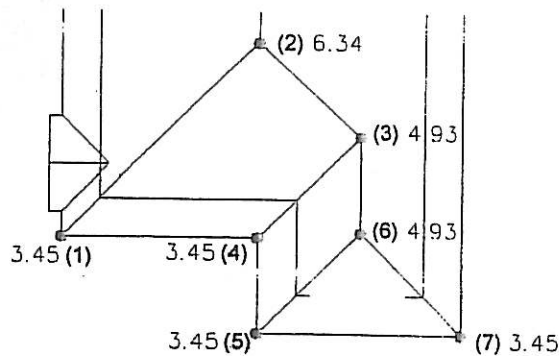
## 2) ROOF II



## 4) ROOF IV



## 3) ROOF III



**STEP E: EDGE** - Changes the visibility of three-dimensional face edges

Command : **EDGE** (enter)  
Specify edge of 3dface to toggle visibility or [Display] : Select an edge  
Specify edge of 3dface to toggle visibility or [Display] : (enter)



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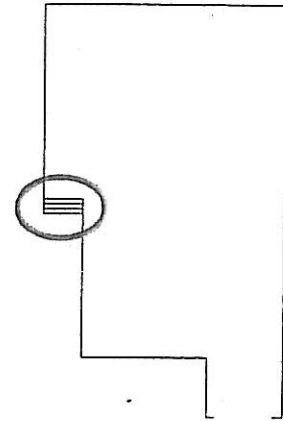
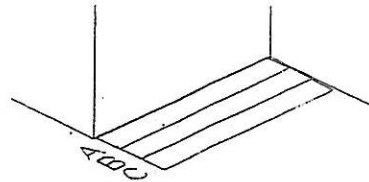
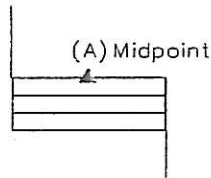
**AutoCAD**

## STEP F: ELEVATION

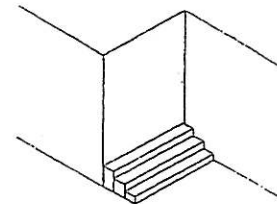
## 1) LAYER

Command: LA (enter)NAME : ELEVATION  
COLOR : RED

## 2) KITCHEN STEPS



## 2.1) TRACE

Command : TRACE (enter)Trace width <0.0500> : 1.9From point : MID of (pick line (A))To point: @.25<270To point: @.25<270To point: @.25<270To point: press enterfig.XII-9. Showing  
kitchen steps

## 2.2) CHANGE PROPERTIES

| Object | CHANGE or PROPERTIES |           |
|--------|----------------------|-----------|
|        | Thickness            | Elevation |
| A      | 0.45                 | 0         |
| B      | 0.30                 | 0         |
| C      | 0.15                 | 0         |

Command: MO (enter)/CH (enter)

1

2

Polyline

Color ☐ ByLayer

Layer FASCIA

Linetype ☐ ByLayer

Linetype scale 1.00

Plot style ByColor

Lineweight ☐ ByLayer

Hyperlink

Thickness 0.00

Vertex 1

Vertex X 13.86

Vertex Y 16.31

Start segment width 0.00

End segment width 0.00

Global width 0.00

Elevation 0.00

Area 1296.30

Specifies the elevation of the polyline relative to the Z axis of the objects' coordinate system (Z coordinate of curve...



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### 3) MAIN ENTRY STEPS

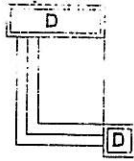
#### 3.1) TRACE



#### 3.2) MOVE



#### 3.3) RECTANG



#### 3.4) CHANGE PROPERTIES

| Object | CHANGE OF PROPERTIES |           |
|--------|----------------------|-----------|
|        | Thickness            | Elevation |
| A      | 0.15                 | 0.30      |
| B      | 0.15                 | 0.15      |
| C      | 0.15                 | 0         |
| D      | 1.00                 | 0         |

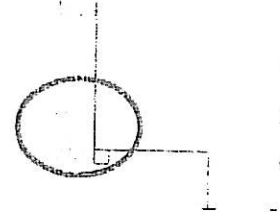
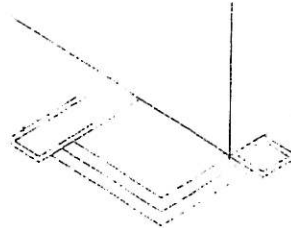
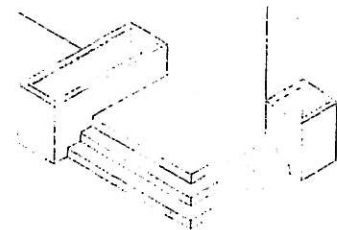


fig.XI-10. Showing main entry steps



Exer. # 2: Complete 3D Model door & window profiles

#### WALL I

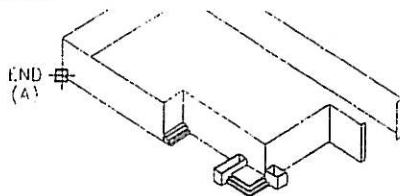
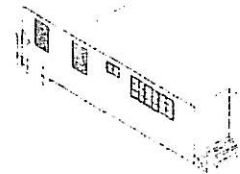


fig. XII-14. Defining new origin point



#### 1) UCS (orthoGraphic)

- Command : **UCS** (enter)  
Specify origin of UCS or [Face/NAmed/OBject/Previous/View/World/X/Y/Z/ZAis]  
<World> : **G** (enter)  
Enter an option [Top/Bottom/Front/BAck/Left/Right]<Left> : **L** (enter)

#### 2) UCS (New)

- Command : **UCS** (enter)  
Specify origin of UCS or [Face/NAmed/OBject/Previous/View/World/X/Y/Z/ZAis]  
<World> : **N** (enter)  
Specify origin of new UCS or [ZAxis/3point/OBject/Face/View/X/Y/Z] <0,0,0> : **END of (pick A)**



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## 3) INSERT

 Command : INSERT (enter)  
 Look in : C:\LIB  
 Filename : 1W (1W2, 3W2)  
 Specify insertion point or: NEA to (pick line B)

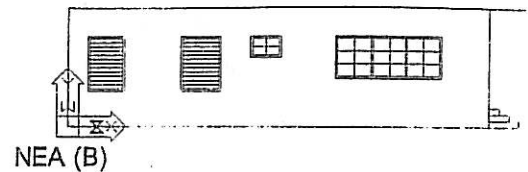
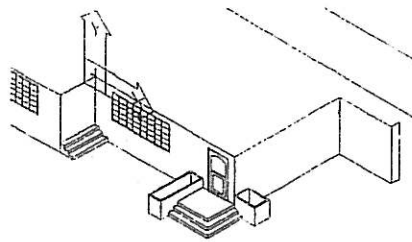
WALL II

fig.XI-15. Defining new origin point

## 1) UCS (New)

## 2) INSERT

 Command : INSERT (enter)  
 Look in : C:\LIB  
 Filename : 4W (EDR1)  
 Specify insertion point or: NEA to (pick lower portion of the wall)

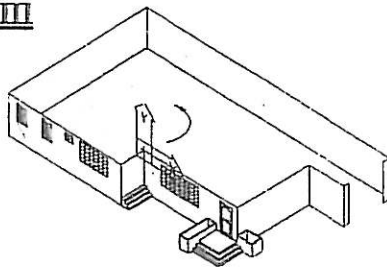
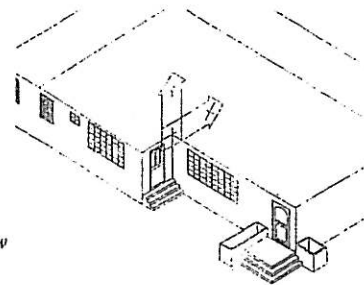
WALL III

fig.XII-16. Defining new origin point



## 1) UCS (X Y Z)

 Command : UCS (enter)  
 Specify origin of UCS or [Face/NAmed/OBJect/Previous/View/World/X/Y/Z/ZAis]  
 <World> : N (enter)  
 Specify origin of new UCS or [ZAxis/3point/OBJect/Face/View/X/Y/Z] <0,0,0> : Y (enter)  
 Specify rotation angle about Y axis <90> : (enter)



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## 2) INSERT or AutoCAD DESIGN CENTER

Command : INSERT (enter)  
Look in : C:\LIB  
Filename : EDR2  
Specify insertion point or : NEA to (pick D)

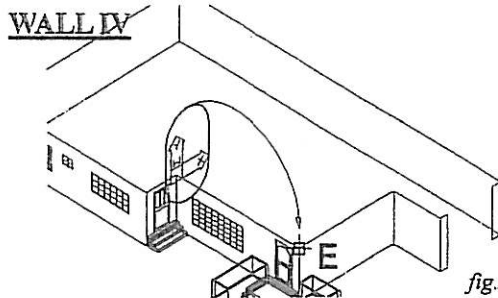
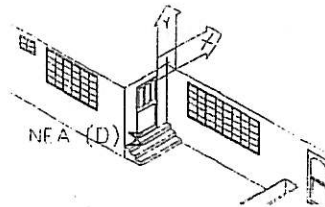


fig.XI-16. Defining new origin point

### 1) UCS (New)

Command : UCS (enter)  
Specify origin of UCS or [Face/NAmed/OBject/Previous/View/World/X/Y/Z/ZAis] : N (enter)  
<World>  
Specify origin of new UCS or [ZAxis/3point/OBject/Face/View/X/Y/Z] <0,0,0> : END of (pick E)

### 2) INSERT

Command : INSERT (enter)  
Look in : C:\LIB  
Filename : 4W  
Specify insertion point or : NEA to

Exer. #3: Applying hatch (shingle-type) to roof

### ROOF I

### 1) LAYER

Command : LA (enter)  
Name : SHINGLES  
Color : MAGENTA  
\*make it current\*

### 2) UCS (3point)

Command : UCS (enter)  
Specify origin of UCS or [Face/NAmed/OBject/Previous/View/World/X/Y/Z/ZAis] : N (enter)  
<World>  
Specify origin of new UCS or [ZAxis/3point/OBject/Face/View/X/Y/Z] <0,0,0> : 3 (enter)  
Specify new origin point <0,0,0> : END of (pick Origin location)  
Specify point on positive portion of X-axis <0,0,0> : NEA to (pick X direction)  
Specify point on positive-Y portion of the UCS XYplane <0,0,0> : NEA to (pick Y direction)

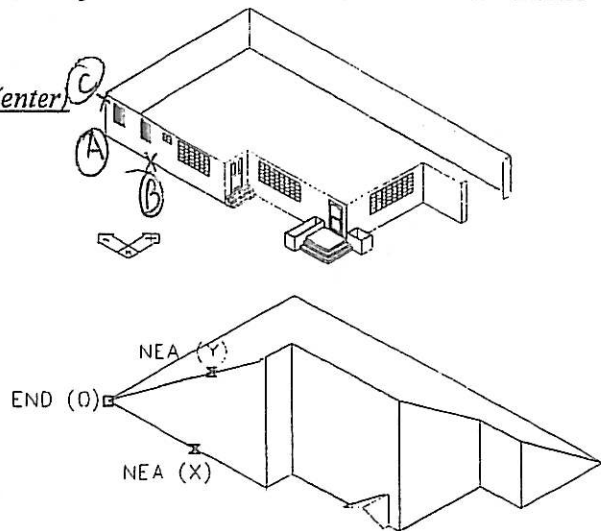


fig.XII-18. Using UCS 3point



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### 3) HATCH

 Command : BHATCH (enter)  
 Pattern name : AR-RSHKE  
 Scale : 0.0015  
 Angle : 0



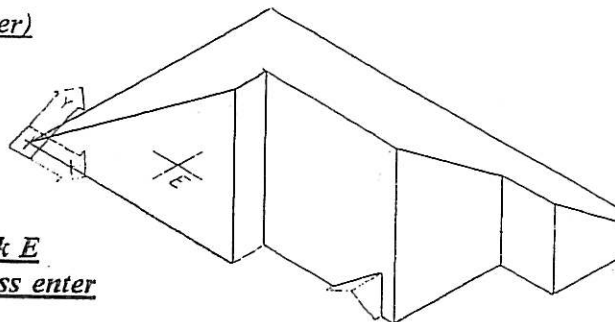
Add: Pick points

Select internal point : pick E  
 Select internal point : press enter

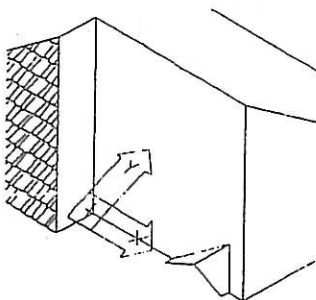
Preview

<Hit enter or right-click to return to the dialog> : press enter

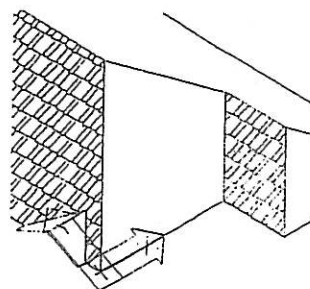
OK



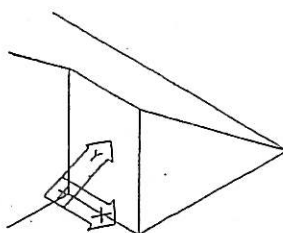
\* COMPLETE THE ENTIRE ROOF \*



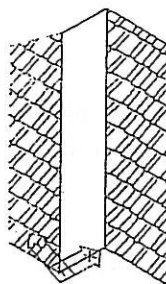
II (NEW)



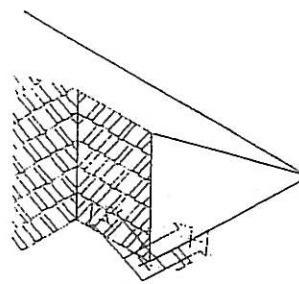
IV (3POINT)



III (NEW)



V (NEW)



VI (3POINT)



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## 3D ORBIT

Controls the interactive viewing of objects in 3D



3DORBIT enables you to manipulate the view of 3D objects by clicking and dragging your pointing device. You can view your entire drawing or select one or more objects before starting the command. Viewing the entire drawing may degrade the video display.

The 3DORBIT manipulates the model using various techniques.

- Performs fast, realtime rotation and zooming of a 3d model in either wireframe or shade mode.
- Rotates the model in free form orbit.
- Views the model in perspective or parallel view.
- Displays a 3D-grid plane to improve understanding of your design.

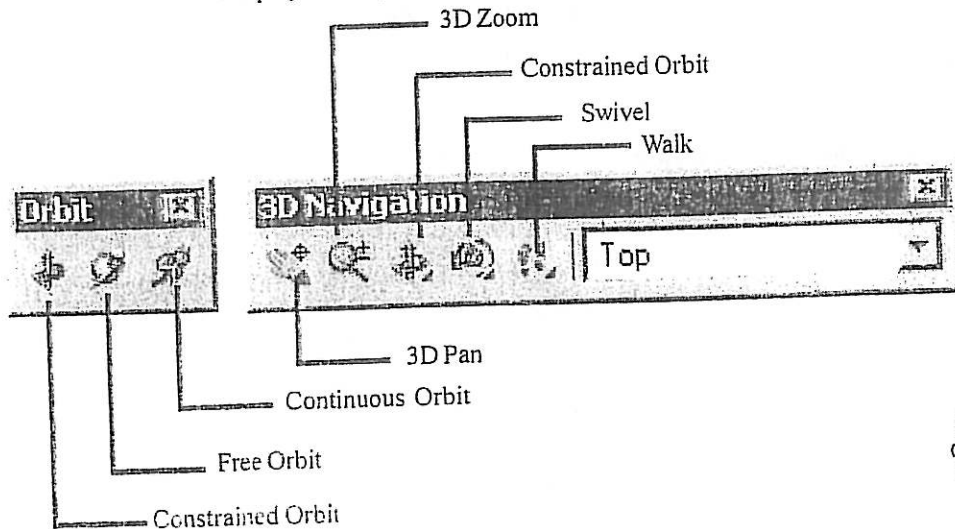
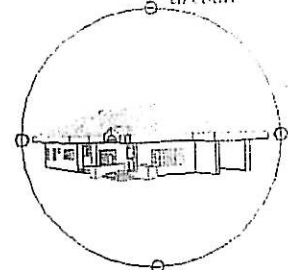


fig. XIII-9. Showing 3D Orbit archball



**3D Orbit.** Moves around a target. The target of the view stays stationary while the camera location, or point of view, moves. The center of the viewport, not the center of the objects you're viewing, is the target point.

**Constrained Orbit.** Constrains 3D Orbit along the XY plane or the Z axis.

**Free Orbit.** Orbits in any direction without reference to the planes. The point of view is not constrained along the XY plane or the Z axis.

**Continuous Orbit.** Orbits continuously. Click and drag in the direction you want the continuous orbit to move, and then release the mouse button. The orbit continues to move in that direction.)

**Adjust Distance.** Changes the distance of objects as you move the cursor vertically. You can make objects appear larger or smaller, and you can adjust the distance.

**Swivel.** Simulates panning with a camera in the direction that you drag. The target of the view changes. You can swivel the view along the XY plane or along the Z axis.

**Zoom.** Simulates moving the camera closer to an object or farther away. Zooming in magnifies the image.

**Pan.** Starts the interactive 3D view and enables you to drag the view horizontally and vertically.



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## VIEWING A 3D MODEL

Exer. # 1: Display a 3d Model using 3D Orbit (Open 3D Model from lib.)

 Right click in any tool then click 3D orbit to display 3D Orbit toolbar.

Command : **3DO (enter)**

An arcball with circular graphics and the 3D UCS icon are displayed

step 1

- On 3D Orbit toolbar click **View** box, then **SW Isometric**.

step 2

- With arc ball display, click and drag the cursor within Arcball to rotate the wireframe model in ORBIT mode.

step 3

- Right-click on drawing to display the shortcut menu, choose **Visual Style** then select **Conceptual**

 The model remains shaded. This is *persistent shading*. The model is shaded using current color. In this example, the object is colored on a black background.

step 4

- Right-click on drawing to display the shortcut menu, select **Perspective**

step 5

- Right-click on drawing to display the shortcut menu, choose **Visual Aids** then select **Grid**

step 6

- Right-click on drawing to display the shortcut menu, choose **Other Navigation Modes** then select **Adjust Distance**

step 7

- Right-click on drawing to display the shortcut menu, choose **Other Navigation Modes**, select **Pan** or **Zoom**

step 8

- To exit the command, press ENTER, ESC, or click EXIT on the shortcut menu.

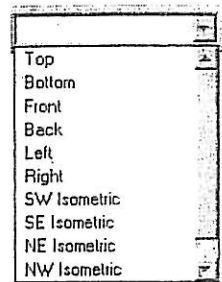


fig.XII-10. Showing 3D Orbit view box

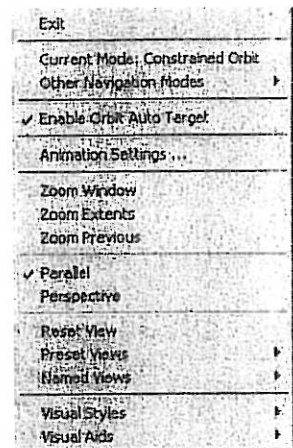


fig.XII-11. Showing 3D Orbit shortcut menu

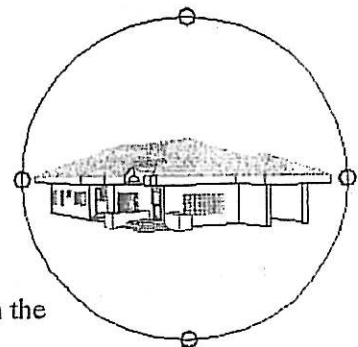


fig.XIII-12. Showing 3D Model view



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## CAMERA

Sets a camera and target location to create and save a 3D perspective view of objects

### OPTIONS:

- ? - Displays a list of the currently defined cameras
- Name - Names a camera
- Location - Specifies the location of the camera.
- Height - Changes the camera height
- Target - Specifies the target of the camera
- Lens - Changes the lens length of the camera.
- Clipping - Defines front and back clipping planes and sets their values.
- View - Sets the current view to match the camera settings
- Exit - Cancels the command

### Step 1 - To Place a Camera

Command: **CAMERA** or from **DASHBOARD**

Specify camera location: **.XY (enter)**

of **pick (A)**

(need Z): **1.5 (enter)**

Specify target location: **.XY (enter)**

of **pick (B)**

(need Z): **1.5 (enter)**

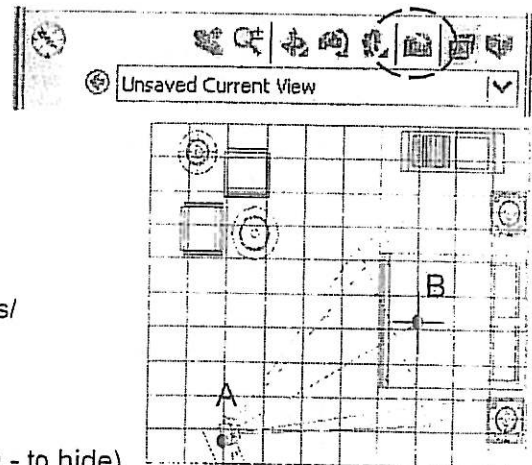
Enter an option [?/Name/LLocation/Height/Target/Lens/

Clipping/View/eXit]<eXit>: **enter**

Command : **CAMERADISPLAY**

: **1**

(Note: 1 - to display the camera; 0 - to hide)



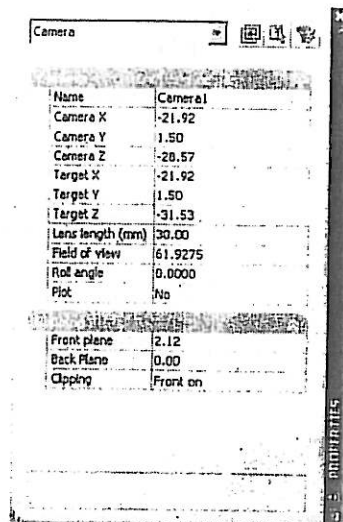
### Step 3 - To View the Perspective

1. Click the camera
2. Right-click, select **SET CAMERA VIEW**
3. Right-click again, click **Properties**

### Step 4 - Control the Properties of the camera from Properties palette

### Step 5 - To Update the Perspective view

1. Right-click on the drawing area select **SET CAMERA VIEW**



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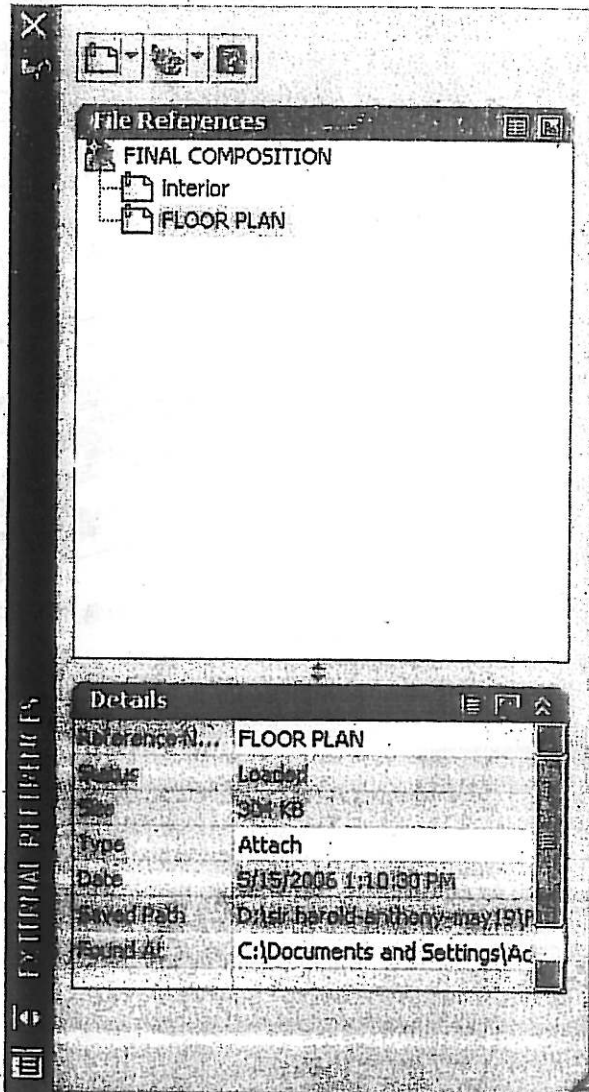
**AutoCAD**

## External Reference (XREF)

When you attach a drawing as an xref, you link that referenced drawing to the current drawing; any changes to the referenced drawing are displayed in the current drawing when it is opened or reloaded. You can attach an entire drawing to the current drawing as a referenced drawing (xref). With xrefs, changes made in the referenced drawing are reflected in the current drawing. Attached xrefs are linked to, but not actually inserted in, another drawing. Therefore, with xrefs you can build drawings without significantly increasing the drawing file size.

### COMMAND : XR or XREF

or from Pull-down menu, click *Insert*  
 >> *External References*



### OPTIONS:

**ATTACH DWG**- When you attach a drawing as an xref, you link that referenced drawing to the current drawing

**DETACH** - To completely remove xrefs from your drawing. Using the Detach option removes the xrefs and all associated information.

**UNLOAD** - The xref is not displayed, and nongraphical object information does not appear in the drawing. When an xref is unloaded from the current drawing, the drawing opens much faster and uses less memory

**RELOAD** - Reloads one or more DWG references. This option reloads and displays the most recently saved version of that drawing.

**BIND** - Converts DWG references (xrefs) to standard local block definitions. If you bind an xref into the current drawing, the xref and all its dependent named objects become a part of the current drawing.



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## I TILED VPORTS AND FLOATING VPORTS

### A: TILED VPORTS

- limited no. of vports (64)
- vports in tiled format
- they exist in Model Space
- only active vport is printable
- suitable for drafting and editing purposes

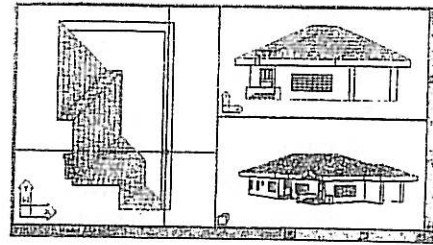


fig.XIV-3. Tiled vports

### B: FLOATING VPORTS / MVIEW

- varying size, may overlap and unlimited no of vports (but you can see only up to 64 viewports),
- you can create non-rectangular vports
- all vports can be printed
- floating vports exist in Layout

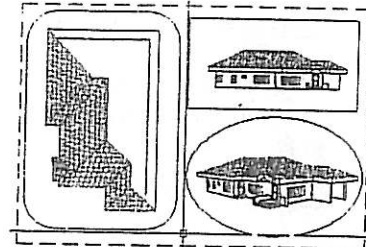


fig.XIV-4. Floating vports

## II MODEL SPACE AND LAYOUT

### A: MODEL SPACE

- a three dimensional drawing environment
- you can create two-dimensional or three-dimensional drawings
- the Model tab automatically sets the TILEMODE system variable to 1
- you can create Tiled Vports to display various views of your model drawing
- the Model tab cannot be deleted

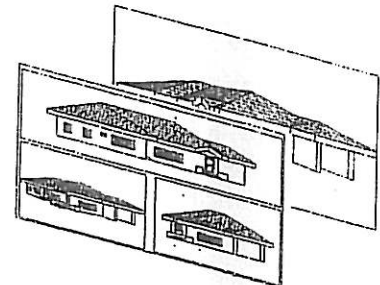


fig.XIV-5. About model and layout

### B: LAYOUT (formerly PAPER SPACE)

- a two dimensional drawing environment
- layout is used to compose or lay out your model drawing for plotting
- you can design Floating Viewport configurations to visualize different details in your drawing
- the Layout tab automatically sets the TILEMODE system variable to 0



fig.XIV-6. Model and layout tab

### COMMAND ASSOCIATED:

1. TILEMODE - to switch to Paper space(0) or to Model space(1).
2. MVIEW - command to create multiple vports or views
3. MS - switches from paper space to a model space viewport
4. PS - Switches from a model space viewport to paper space
5. VPLAYER - sets layer visibility within mviews
6. ZOOM(XP) - specifies the scale relative to paper space units.



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## VIEWPORT Enhancement

Using previous AutoCAD releases, you can create rectangular viewports in paper space to display different views of the model. With AutoCAD 2004, you can associate a boundary with a rectangular viewport object and clip the geometry in the viewport to the edge of the boundary. Thus, you can create viewports with irregular or nonrectangular boundaries.

### Nonrectangular Viewports

A nonrectangular viewport is created when you associate a clipping object (polyline, circle, region, spline, or ellipse) with a normal viewport object. When you associate these two objects, they remain connected as long as the nonrectangular viewport boundary exists.



If you want to use BHATCH to apply a hatch to a nonrectangular viewport, use the internal point method. If you use the select objects method and try to select the clipped viewport, the underlying rectangular viewport is added to the selection set and is therefore hatched. To apply the hatch inside the viewport boundary, select an internal point.

### The Viewport Toolbar



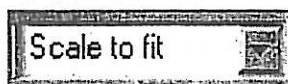
Displays the Viewports dialog

Creates a single paperspace viewport

Creates an irregularly shaped viewport using specified points

Converts an object to a paperspace viewport

Clips Existing Viewport, Clips a paperspace viewport



**Plot Scale** Sets the viewport scale for new viewports and edits the viewport scale of existing viewports

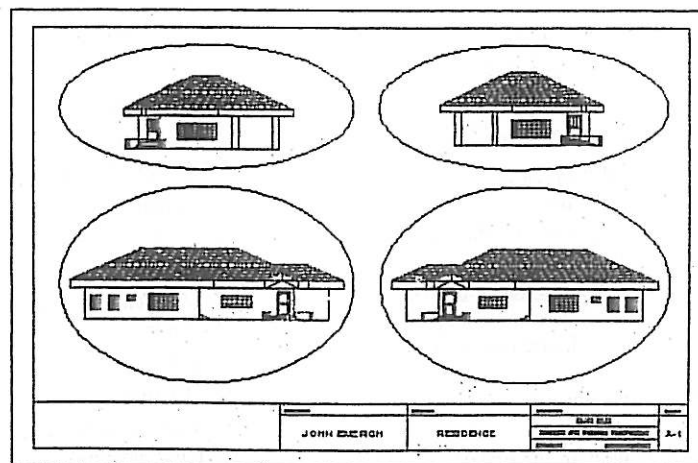


fig.XIV-7. Showing non-rectangular vports



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## PAGE SETUP

Specifies the layout page, plotting device, paper size, and settings for each new layout

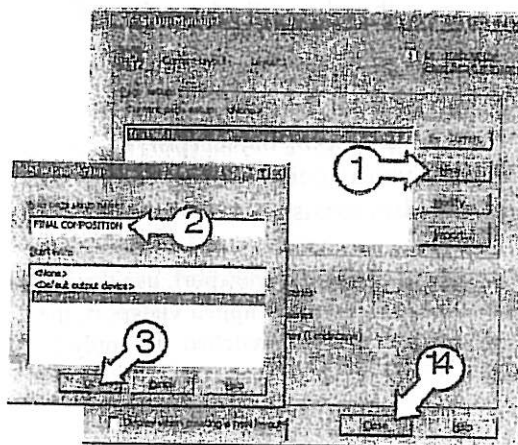


fig.XIV-1. Showing Page Setup Manager and New Page Setup

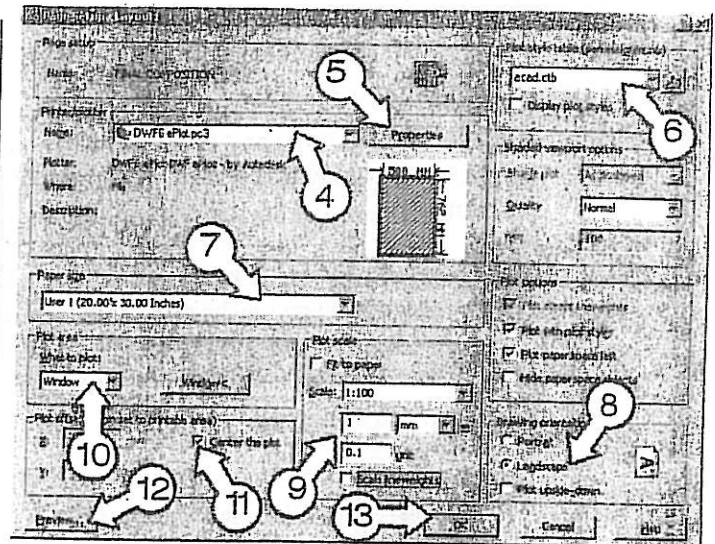


fig.XIV-2. Showing Page Setup

Command : **PAGESETUP** (enter)

### A Page Setup Manager

1. PAGE SETUPS  
click NEW
2. New Page Setup Name  
Name : Final Composition
3. Click OK

### B Page Setup

4. PLOTTER  
Name : (choose the device from the list which you want to use)
5. Click Properties (to the right of the device name) to launch the plotter configuration Editor.
  - 5.1 Choose Custom Paper Sizes at the bottom of the list.
  - 5.2 Choose Add to launch the Custom Paper size wizard.
  - 5.3 Choose Start from Scratch, then Next.
  - 5.4 In the width and length lists, specify the paper width and length. Then choose Next.
  - 5.5 Specify the non-printable area. Then choose Next.
  - 5.6 Enter a name for the paper size. Then choose Next.

- 5.7 Enter a name for the PMP file.
- 5.8 Select Sheet-fed as paper source, then choose Finish.
- 5.9 Choose OK when you are prompted to save a plotter configuration

### 6. Plot Style Table

Name : [select a plot style table from the list. (pen assignment)]

### 7. PAPER SIZE AND PAPER UNITS

Paper Size : User1(508x762mm) ; (215x292mm)

### 8. DRAWING ORIENTATION

Choose : Landscape  
Plot upside-down

### 9. PLOT SCALE

Custom : 1=0.1 (1:100 m) ; [1=0.25 (1:250m)]  
Unit : mm

### 10. PLOT AREA

Choose : Window

### 11. check center the plot

### 12. click Preview

### 13. click OK

### 14. click Close



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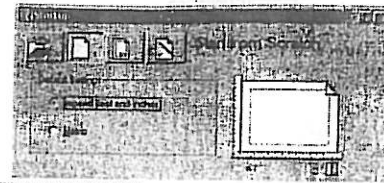
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## FINAL COMPOSITION

### A: START NEW DRAWING

Command : NEW (enter)  
*Start from Scratch (Imperial)*



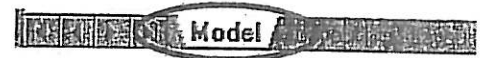
### B: IN MODEL SPACE ATTACH EXTERIOR AND INTERIOR



#### 1) XREF (exterior)

Command : XR (enter)

Command : Z (enter)  
(options) : E (enter)



#### 2) XREF (interior)

Command : XR (enter)

### C: IN PAPER SPACE ATTACH FLOOR PLAN



3) click Layout1 tab

#### 4) PAGESETUP

##### 4.1 Plot Device tab

##### PLOTTER CONFIGURATION

Name : DWF6 ePlot.PC3 (as temporary plotter configuration)

##### Plot Style Table

Name : NONE

##### 4.2 Layout Settings Tab

##### PAPER SIZE AND PAPER UNITS

Paper Size : 18.00' x 24.00"

Printable area : mm

##### DRAWING ORIENTATION

Choose : Landscape

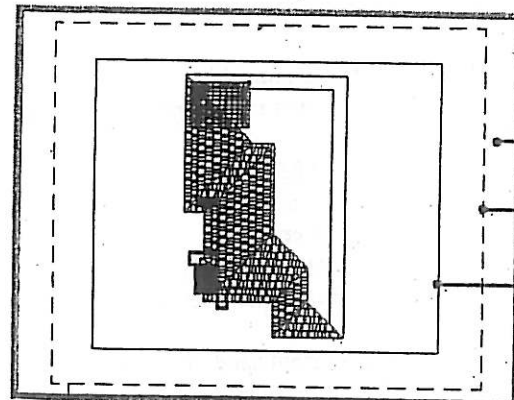
##### PLOT AREA

Choose : Layout

##### PLOT SCALE

Custom : 1=0.1

\*click OK when done\*



paper image

printable area

single viewport



After you click OK, there will be a default single viewport, erase the viewport to create a new one.

Choosing a layout tab places you into the paper space environment. A rectangular outline (shadow) indicates the paper size of the currently configured plotting device. The margins displayed within the paper indicate the printable area of the paper.

You can control the display of the paper background in the layout from the Display tab in the Options dialog box. Also on the Display tab in the Options dialog box, you can control whether the Page Setup dialog box is automatically displayed the first time you select a layout.



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5) XREF (plan)



COMMAND : XR (enter)

D: FLOATING VPORTS

6) MVIEW

\*create two vports for exterior and interior perspective\*

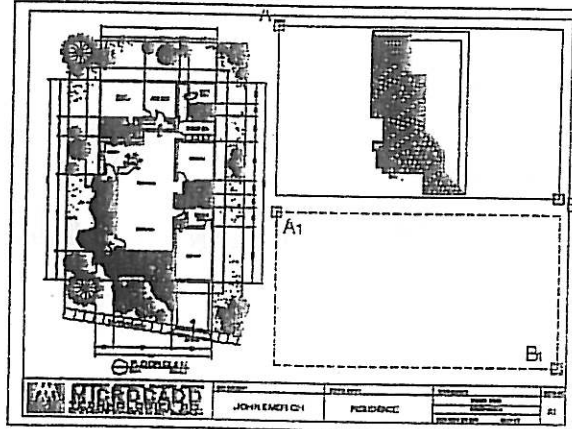
Command : MV (enter)

Specify corner of vport or [ON/OFF/Fit/Hideplot/Lock/Object/Poly/Restore/2/3/4] <Fit>

: pick point (A)

Specify opposite corner

: pick point (B)



Alternative Method:

Command: LAYER (enter)

Expand XREF

Right-click on XREF name (INTERIOR)

Choose Viewport >> Freeze

E: VPORT LAYER

7) MS

Command : MS (enter)

\*make upper right hand vport current\*

8) VPLAYER

Command : VPLAYER (enter)

Enter an option [/?/Freeze/Thaw/Reset/Newfrz/Vpvisdflt] : F

Enter layer name(s) to freeze : I\*

Enter an option [All/Select/Current] <Current> : (enter)

Enter an option [/?/Freeze/Thaw/Reset/Newfrz/Vpvisdflt] : (enter)

\*make lower right hand vport current\*

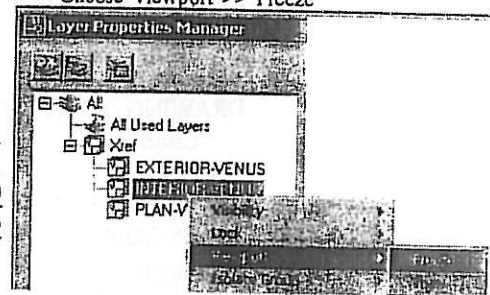
Command : VPLAYER (enter)

Enter an option [/?/Freeze/Thaw/Reset/Newfrz/Vpvisdflt] : F

Enter layer name(s) to freeze : E\*

Enter an option [All/Select/Current] <Current> : (enter)

Enter an option [/?/Freeze/Thaw/Reset/Newfrz/Vpvisdflt] : (enter)



Alternative Method:

Command: LAYER (enter)

Expand XREF

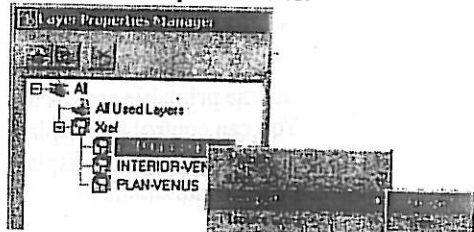
Right-click on XREF name (EXTERIOR)

Choose Viewport >> Freeze

F: CREATING PERSPECTIVE

9) DVIEW or 3DORBIT (See Lesson 12)

Command : DV or 3DO (enter)



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## D: ENTOURAGE

### 10) LAYER

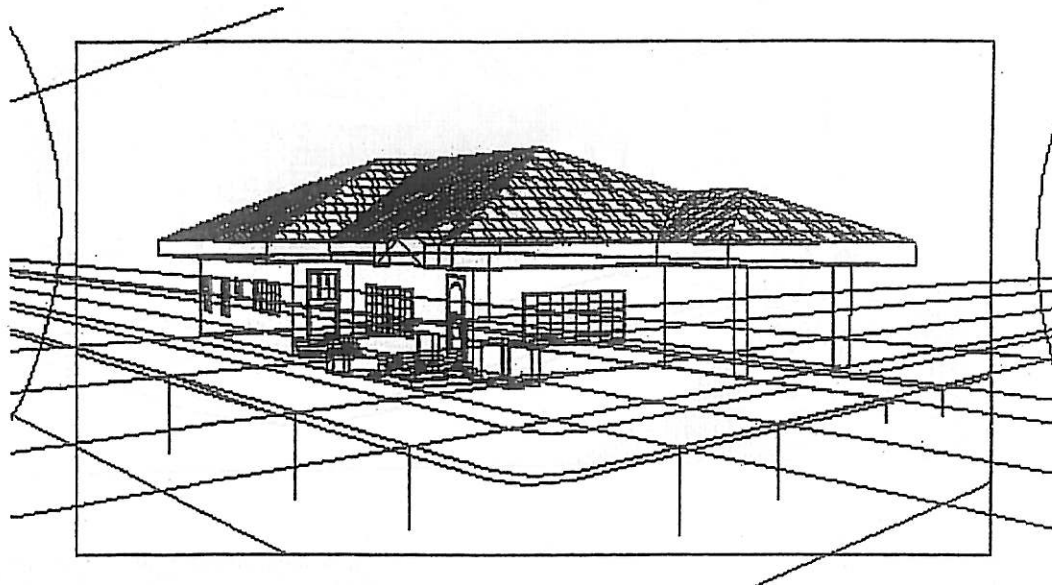
Name : ENTOURAGE

Color : GREEN

Ltype : CONTINUOUS

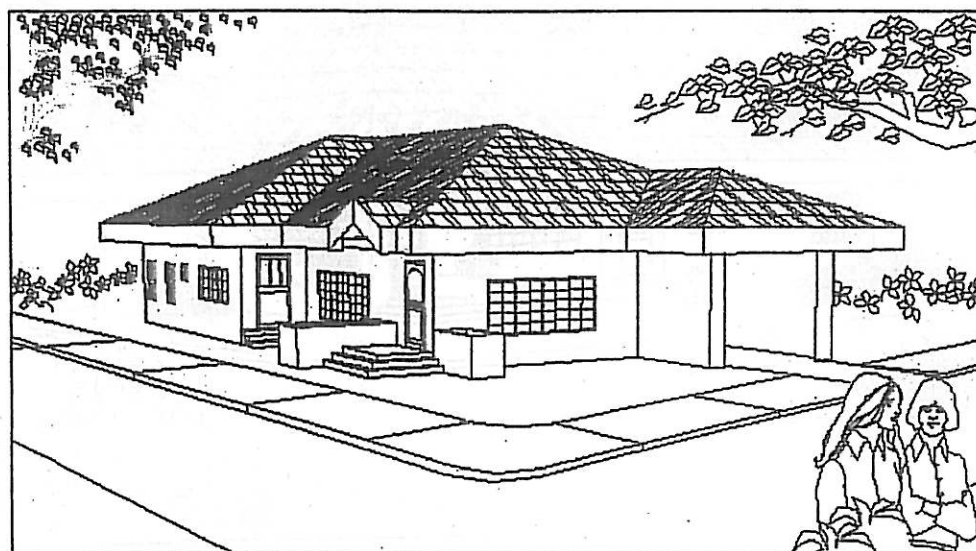
\*make it current\*

### 11) LINE / XLINE / RAY (Create road and sidewalk)



### 12) INSERT / XREF / ADC from LIB folder (optional)

File Name : FEM / BOY / PL / PL2 / PL3 / PL4



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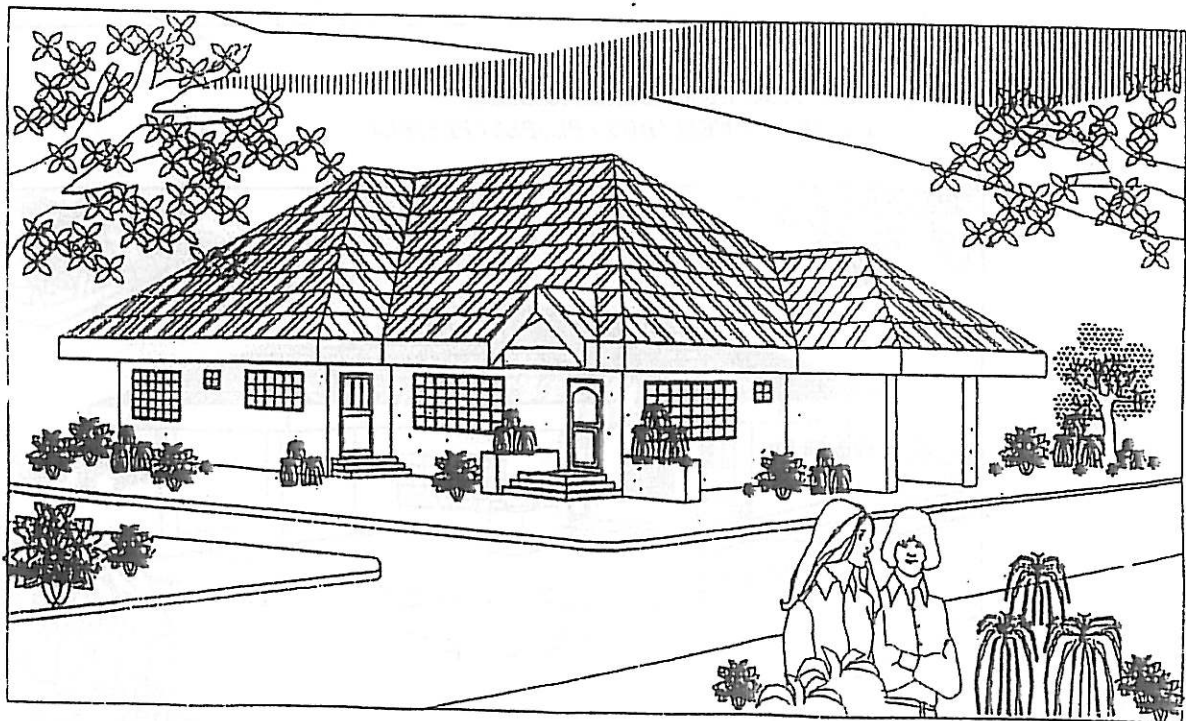
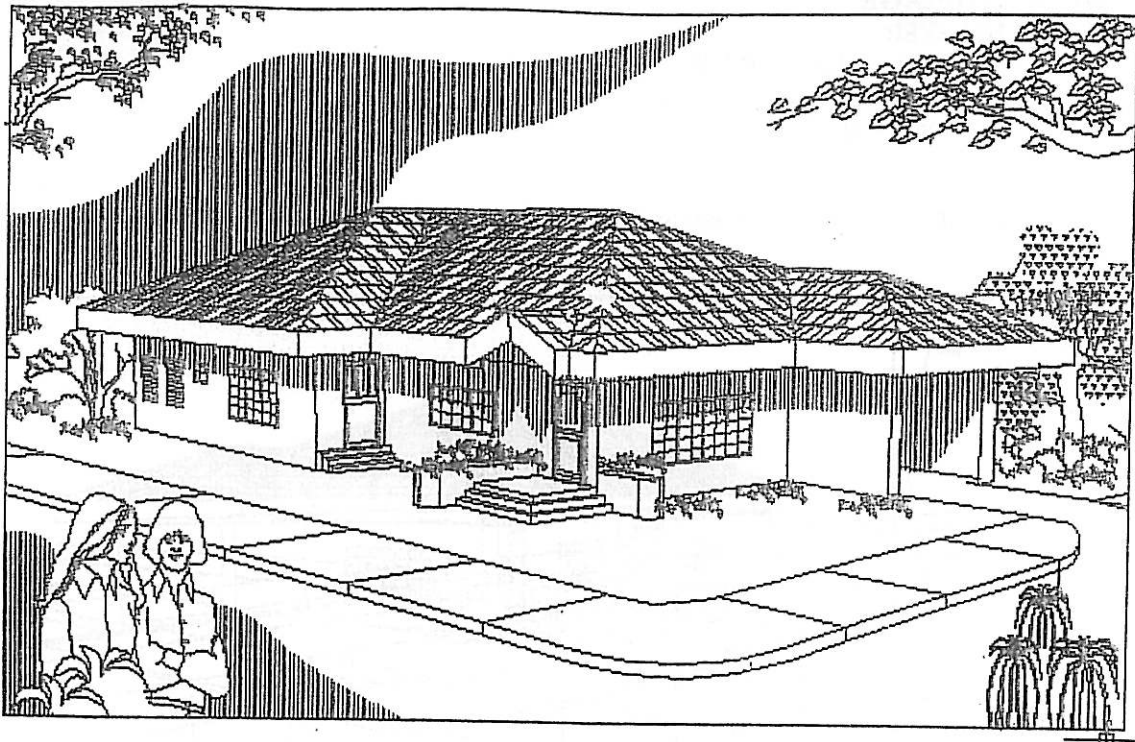
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5th Level  
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# **MICROCADD TECHNOLOGIES CO.**

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**AutoCAD**

## **COLOR RENDERING**

### **Associated Commands**

1. **RENDER** - Creates photorealistic or realistically shaded image of a 3-dimensional wireframe or solid model.
2. **LIGHT** - Manages lights and lighting effects. You can create adjust or delete light source.
  - **POINT LIGHT** - Emits a radiating light beams.
  - **SPOTLIGHT** - Emits a light in a cone in a specified direction.
  - **DISTANTLIGHT** - Emits uniform parallel light rays in one direction only
3. **PREF** - Displays the Advanced Render Settings palette for access to advanced rendering settings
4. **RMAT** - Manages the materials used for rendering.
5. **SAVEIMG** - Save rendered images to a file.
  - BMP - Device independent bitmap file.
  - TGA - Compressed 32 bit RGBA image format.
  - TIFF - Compressed 32 bit RGBA tagged image format.
6. **IMAGE** - Specifies the image file name. You can use the following file types for background images: BMP, JPG, PCX, TGA, and TIFF.
7. **SETUV** - Defines how materials are mapped onto objects.
8. **FOG** - Defines the cues for distance between objects and the current viewing direction. Fog uses a white color while depth cueing uses black
9. **RENDERWIN** - Displays the Render Window without invoking a render task.
10. **RENDERPRESETS** - You can control many of the settings that affect how the renderer processes a rendering task, especially when rendering higher quality images.

#### **a. Use the Render Settings Palette**

The Render Setting palette contains the main controls for the renderer. You can choose from predefined render settings or make custom settings.

- b. **Create Custom Render Presets** When you specify a collection of render settings that give you the results you want, saving them as a custom preset lets you quickly reuse the settings.

#### **c. Control the Rendering Environment**

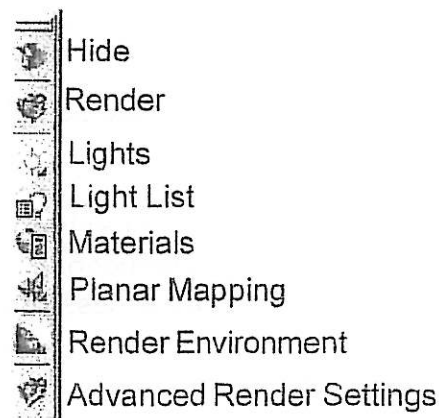
You can use environmental features to set up atmospheric effects or background images.

11. **VIEW** - Saves and restores named views, camera views, layout views, and preset views
12. **LIGHTLIST** - Opens the Lights in Model window to add and modify lights

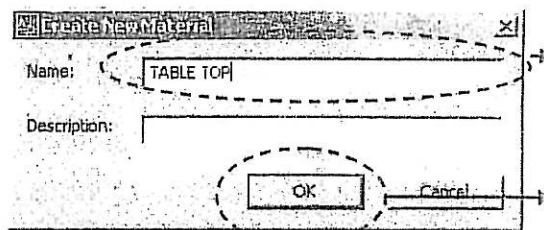
|                                                                                                                       |  |                                                                                    |  |                                                                                                                                                 |  |                                                                |  |
|-----------------------------------------------------------------------------------------------------------------------|--|------------------------------------------------------------------------------------|--|-------------------------------------------------------------------------------------------------------------------------------------------------|--|----------------------------------------------------------------|--|
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|                                                                                                                       |  |                                                                                    |  |                                                                                                                                                 |  | SM Bacoor Cavite<br>Ground Flr.<br>☎ (046) 9701976             |  |



## Basic Rendering



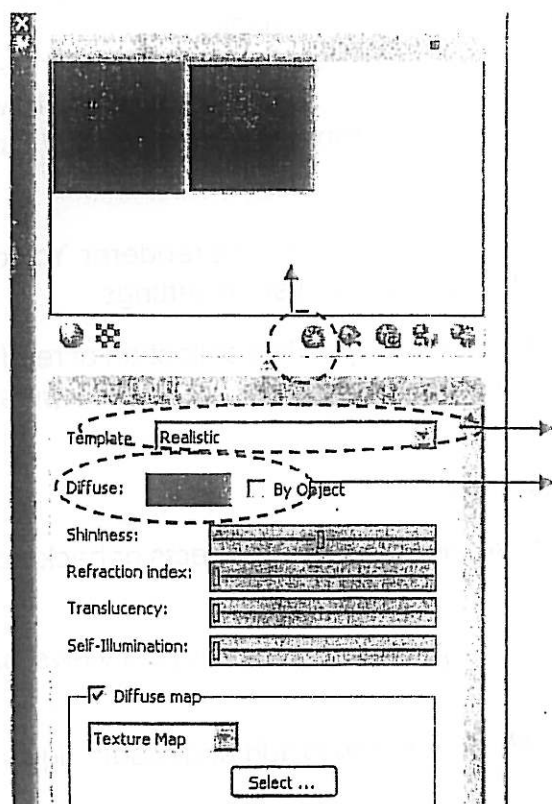
- 1 In the Materials window, click "Create New Material"
- 2 In the Create New Material dialog box, enter a name and description(optional).



## Assigning Color

Command: RMAT

Material Windows will appear on your screen



3. Click OK.
- ↓ A new material slot is placed at the end of the panel and selected
4. Click Diffuse color to assign a color to the material, or select By Object to use the color of the object to which the material is attached.
5. In Template selector, choose "Wood Varnished"
6. Use the sliders to set the following properties
  - a. **Shininess.** Sets the shininess of the material. The highlight on the face of a very shiny solid is smaller and brighter.
  - b. **Refraction Index.** A control how light is refracted through an object with a partially transparent material attached. (Not available for metal templates.)
  - c. **Translucency.** Sets the translucency of the material. A translucent object transmits light, but light is also scattered within the object. (Not available for metal templates.)
  - d. **Self-illumination.** When set to a value more than 0, makes the object appear to give off light, independent of the lights in the drawing. (Not available for metal templates.)



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AutoCAD

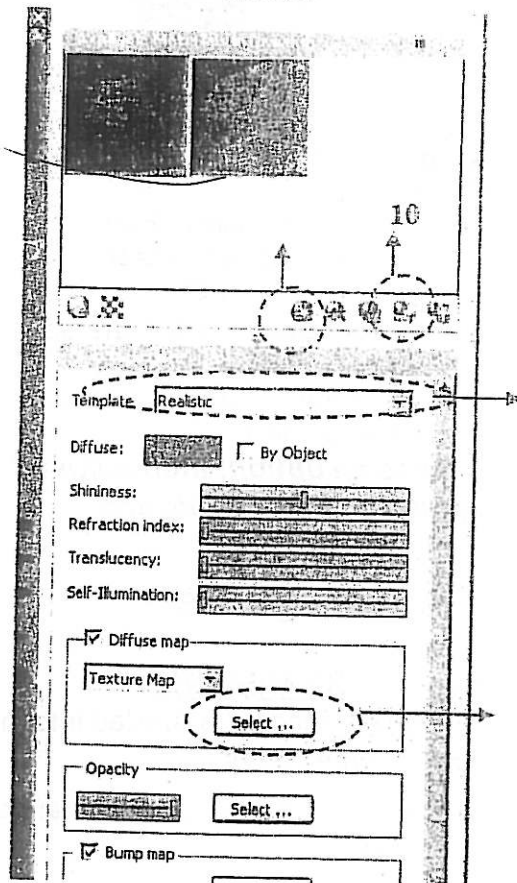


## Assigning Material

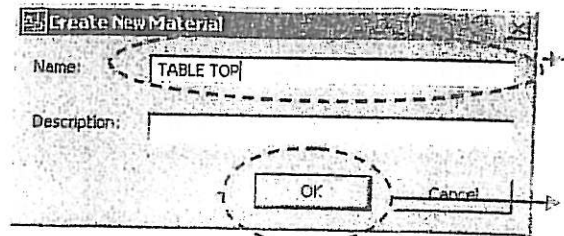
The following types of files can be used as maps:

- BMP (.bmp, .rle, .dib)
- GIF (.gif)
- JFIF (.jpg, .jpeg)
- PCX (.pcx)
- PNG (.png)
- TGA (.tga)
- TIFF (.tif)

Command: RMAT



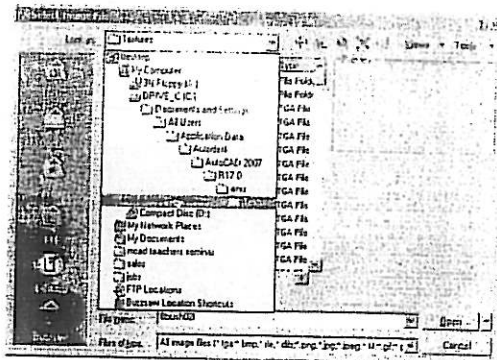
1. In the Materials window, click *"Create a New Material"*
2. In the Create New Material dialog box, enter a *name* and an optional description.



3. Click **OK**.

4. A new material slot is placed at the end of the panel and selected

4. In Template selector, choose *“Wood Varnished”*
5. Select *Texture Map* and
6. Select Diffuse Map *“Select”*.
7. Under *“Look in”* Go to the right folder as shown.



8. Select the desired Image

*Eg. Finishes Flooring Bamboo*

9. Click *Open*.

10. Select “*Apply Material to the Objects*” icon

Select objects: *Pick the JAR*

Select objects or [U]: *Press enter*

11. Select close "X" to exit this dialog box

After you apply the map, you can adjust it to fit on the face or object by using material mapping



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